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TRANSACTIONS

OF THE

American Dental Association

AT THE

THIRTEENTH ANNUAL SESSION,

HELD AT PUT-IN-BAY,

COMMENCING AUGUST 5TH, 1873.

BOSTON MEDICAL
JUN 29 1891
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PUBLICATION COMMITTEE.

M. S. DEAN, G. H. CUSHING, H. A. SMITH.

CHICAGO:
KNIGHT & LEONARD, PRINTERS.
1873.

755

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MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION.

BY M. S. DEAN, SECRETARY.

THE AMERICAN DENTAL ASSOCIATION commenced its Thirteenth Annual Session in Beebe House Hall, at Put-in-Bay, Ohio, August 5, 1873, at 10:30 A. M.; the President, P. G. C. HUNT, in the chair.

The meeting was opened with prayer by the Rev. G. BOSLEY, of Put-in-Bay.

On roll-call, the following permanent members, having paid their dues for the year 1873, were present:

W. H. GODDARD,	Louisville, Ky.
J. TAFT,	Cincinnati, O.
P. G. C. HUNT,	Indianapolis, Ind.
HOMER JUDD,	St. Louis, Mo.
T. L. BUCKINGHAM,	Philadelphia.
E. HONSINGER,	Chicago, Ill.
G. F. S. WRIGHT,	Pomaria, S. C.
A. W. HARLAN,	Chicago, Ill.
M. S. DEAN,	Chicago, Ill.
M. L. CHAIM,	New York.
W. H. EAMES,	St. Louis, Mo.
GEO. H. CUSHING,	Chicago, Ill.
H. A. SMITH,	Cincinnati, O.
D. B. FREEMAN,	Chicago, Ill.
H. L. SAGE,	Bridgeport, Conn.

G. B. McDonneld,	Coneautville, Pa.
W. T. Wallace,	Kingsville, O.
Seneca B. Brown,	Fort Wayne, Ind.
W. C. Dyer,	Chicago, Ill.
A. E. Lyman,	Warren, O.
F. S. Whitslar,	Youngstown, O.
C. Fones,	Bridgeport, Conn.
W. M. Herriott,	Zanesville, O.
Edmund Osmond,	Cincinnati, O.
Frank Abbott,	New York.
G. C. Daboll,	Buffalo, N. Y.
S. H. McCall,	Binghampton, N. Y.
H. S. Chase,	St. Louis, Mo.
G. R. Thomas,	Detroit, Mich.
F. Herriott,	Zanesville, O.
G. W. Keely,	Oxford, O.
J. W. Baxter,	Vevay, Ind.
M. H. Webb,	Lancaster, Pa.
W. H. Morgan,	Nashville, Tenn.
Chas. E. Dunn,	Louisville, Ky.
B. T. Spellman,	Detroit, Mich.
Corydon Palmer,	Warren, O.
B. Oscar Doyle,	Louisville, Ky.
John C. Wyman,	Brooklyn, N. Y.
W. H. Atkinson,	New York.
J. R. Walker,	New Orleans.
F. J. Richards,	Williamsport, Pa.
G. W. Klump,	Williamsport, Pa.
J. C. Whinery,	Salem, Ohio.
Isaiah Forbes,	St. Louis, Mo.
D. W. Clancey,	Cincinnati, O.
E. S. Holmes,	Gr. Rapids, Mich.
Chas. R. Butler,	Cleveland, O.
G. L. Field,	Detroit, Mich.
W. G. Cummings,	Sturgis, Mich.
J. A. W. Davis,	Chicago, Ill.
C. H. Biddle,	Brooklyn, N. Y.
E. J. Waye,	Sandusky, O.
C. C. Carroll,	Meadville, Pa.
E. F. Davis,	Galesburg, Ill.

The following members, being absent, forwarded their dues:

W. W. Allport,	Chicago.
S. A. Freeman,	Buffalo, N. Y.
J. N. Scranton,	Bennington, Vt.

C. W. STAINTON,	Buffalo, N. Y.
J. H. MCQUILLEN,	Philadelphia.
AARON COLTON,	Hudson, N. Y.
J. J. BIRGE,	San Francisco, Cal.
J. N. CROUSE,	Chicago, Ill.
S. W. DENNIS,	San Francisco, Cal.
WM. DUTCH,	San Francisco, Cal.
J. F. CANINE,	Louisville, Ky.
H. B. NOBLE,	Washington, D. C.
F. PEABODY,	Louisville, Ky.
L. D. SHEPARD,	Boston, Mass.
J. S. HILL,	Gettysburg, Pa.
E. A. BOGUE,	New York.
C. D. COOK,	Brooklyn, N. Y.
C. F. WHEELER,	Albany, N. Y.
S. B. PALMER,	Syracuse, N. Y.

New members, who signified their wish to become permanent:

J. E. LOW,	Chicago, Ill.
JAS. E. JOHNSTONE,	Staunton, Va.
E. D. SWAIN,	Chicago, Ill.
C. C. KNOWLES,	San Francisco, Cal.
I. KNAPP,	Fort Wayne, Ind.
L. BUFFETT,	Cleveland, O.
J. E. ROBINSON,	Cleveland, O.
I. DOUGLASS,	Romeo, Mich.
E. HUNTER,	Manchester, Mich.
J. M. AUSTIN,	St. Joseph, Mo.
W. P. HALL,	
A. F. MCLAIN,	New Orleans, La.
J. F. THOMPSON,	Chicago, Ill.
C. H. DARBY,	St. Joseph, Mo.

The reading of the minutes of the preceding year was called for, and, on motion, omitted.

On motion of Dr. Cushing, the Treasurer called the names of those whose credentials had been passed upon, but who had not paid their dues.

Dr. Cushing, chairman of the Committee on Credentials, made a partial report of the members whose credentials were found satisfactory, which was accepted and adopted:

Subsequently the same committee reported the names of qualified delegates, and the associations by which they were appointed, as follows:

California State Dental Association—C. C. Knowles.
Pennsylvania Association of Dental Surgeons—Spencer Roberts.
Pennsylvania State Dental Society—G. B. McDonneld, M. H. Webb, J. L. Smith.
Pennsylvania College of Dental Surgery—T. L. Buckingham.
Chicago Dental Society—M. S. Dean, A. W. Harlan, Geo. H. Cushing, E. D. Swain, W. C. Dyer.
Illinois State Dental Society—J. E. Low, E. Honsinger, D. B. Freeman.
Southern Dental Association—Jas. Johnstone, Theo. F. Chupein.
Connecticut State Dental Association—H. L. Sage.
St. Louis Dental Society—G. A. Bowman.
Northern Ohio Dental Association—J. E. Robinson, L. Buffett, F. S. Whitslar, B. Strickland.
Kentucky State Dental Association—W. H. Goddard, B. Oscar Doyle, Chas. E. Dunn, G. W. Priest.
Sixth District Dental Society of New York—S. H. McCall.
Indiana State Dental Association—J. W. Baxter, I. Knapp, R. H. Clayton, J. K. Jameson, S. B. Brown, B. P. McDonald, W. F. Morrill.
Michigan Dental Association—G. E. Corbin, I. Douglass, E. Hunter.
Forest City Society of Dental Surgeons—Chas. Buffett.
Ohio Dental College Association—W. G. Redman.
Philadelphia Dental College—T. C. Stellwagen.
Missouri State Dental Association—J. M. Austen, W. M. Hammond, C. H. Darby.
New Orleans Dental Association—J. R. Walker, A. F. McLain.
Susquehanna Dental Association—T. J. Richards.
Harvard Dental College—T. B. Hitchcock.
Brooklyn Dental Society—W. H. Atkinson, John C. Wyman.
Mississippi Valley Dental Association—James Leslie.

Dr. Taft moved a suspension of the order of business, for the purpose of taking up the proposed amendments to the constitution. Dr. Goddard amended, by making it the special order of business at 3 o'clock. The motion, as amended, prevailed.

The report of the Committee on Physiology was called, and read by the chairman, M. S. Dean.

Adjourned to meet at 2 o'clock P. M.

FIRST DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment; the President in the chair. Minutes of the morning session read and approved.

On motion of Dr. Buckingham, Dr. J. M. Whitney, of Honolulu, was invited to participate in the discussions of the Association.

At the hour of three the special order of business was called up; *i. e.*, the consideration of the proposed amendments to the constitution.

The amendment to Art. III, Sec. 3, was adopted without discussion. As amended it reads as follows:

MEMBERS TO BE OF TWO CLASSES.—The members of this Association shall be of two classes—delegates and permanent members,—having equal rights and privileges, except eligibility to office; none being eligible but those who, upon signing the constitution and paying their dues, shall declare their intention of becoming permanent members.

Amendment to Art. III, Sec. 4, was lost.

Amendment to Art. IX was lost.*

The amendment to Art. VI, Sec. 1, by adding, in its proper place, "a Committee on Etiology," was adopted.

The first amendment to Art. V, Sec. 1, was lost.

The amendment to Art. VI, Sec. 1, was lost.

The second amendment to Art. III, Sec. 3, was lost.

The amendment to Art. V, Sec. 1, by changing the word "two"—the first word on third line from top of page 5—to "three," and the word "three"—the last word on same line and same page—to "four," was adopted.

Amendment to Art. V, Sec. 6, was adopted.

Dr. Walker offered a motion to rescind the following resolution, adopted in 1872, viz.:

Resolved, That henceforth no person shall be received as a delegate who is in arrears for dues, or until they have paid to the Treasurer the full amount due at the time their names were dropped for non-payment.

The motion prevailed.

---

* This amendment was subsequently adopted. See page 22.

The Committee on Pathology and Surgery was called, and a report read by the chairman, Dr. H. Judd.

The report was discussed by Dr. Atkinson.

On motion of Dr. Taft, the time of the speaker was extended ten minutes.

The Executive Committee offered the following partial report, which was received, and its suggestions adopted:

The Executive Committee would recommend the following as the hours of meeting and adjournment of these sessions, viz.: Meet at 9 o'clock A. M., and adjourn at 12 M. Meet at 2 P. M., and adjourn at 6 o'clock P. M. The Committee request the Association to decide as to holding clinics; and if there are to be clinics, shall there be evening sessions upon the days of such clinics, from 7:30 to 10 P. M.

J. TAFT,
G. H. CUSHING, } *Committee.*
H. A. SMITH,

On motion of Dr. McDonneld, it was decided to devote Thursday morning to clinical operations.

And, on motion of Dr. Taft, it was decided to hold an evening session on Thursday, from 7:30 to 10 o'clock; and that the election of officers be the special business of the evening.

A motion of Dr. McDonneld, that a "quiz" be held on Wednesday evening, and that it be conducted by the President, was lost.

Adjourned till 9 o'clock to-morrow.

SECOND DAY — MORNING SESSION.

The Association met pursuant to adjournment; President in the chair. Minutes were read and adopted.

Dr. Herriott moved that the Association adjourn to the Put-in-Bay House hall.

Dr. Hitchcock's amendment, that Dr. Chase be instructed to give notice to the members that might be assembled at the Put-in-Bay House, that the Association was now in session at the Beebe House hall, was accepted, put, and adopted.

The Committee to prepare a circular on Popular Education was called; the Chairman not being present, and there being no report, the committee was continued, and the time extended to the next annual session.

The President announced discussion on the subject of Pathology and Surgery in order. The subject was discussed by Dr. Judd, and continued by a paper by Dr. H. S. Chase, a member of that committee, upon the same subject. The consideration of the paper was announced in order, and was discussed by Drs. Judd, Atkinson, Spellman, Carroll, Abbott, Walker, Osmond, Morgan, Herriott, Buckingham, Stellwagen, Douglass, and Chase.

Adjourned to 2 o'clock P. M.

SECOND DAY—AFTERNOON SESSION.

The Association met at the appointed hour; President in the chair. The minutes were read and approved.

The subject of Pathology and Surgery was continued, and discussed by Dr. Stellwagen.

The order of business was suspended, and Dr. Taft, chairman of the Executive Committee, made the following report, which was adopted:

Clinics will be held to-morrow, from 8:30 A. M. to 12 M., in the rooms over Put-in-Bay Saloon, now occupied by Messrs. White & Johnston with dental goods.

Diagnostic Clinics, by W. H. Atkinson.

Operative Clinics, by C. Palmer.

Operative and Diagnostic Clinics, by C. R. Butler.

The subject of Pathology and Surgery was passed, and the report on Histology and Microscopy called for. The Committee not being in the room the subject was postponed, and that of Dental Chemistry called. The Committee not being prepared, further time was granted.

The Committee on Therapeutics was called, and the report read by Dr. H. L. Sage, chairman.

The report was discussed by Drs. Atkinson, Taft, Rehwinkel, and Stellwagen.

Dr. F. H. Rehwinkel offered the following, which was adopted, viz.:

Resolved, That the Committee on Therapeutics be, and hereby is, instructed to investigate the difference of action between carbolic acid, creasote, thymol and carvacrol, and indicate the symptoms or peculiar conditions under which one of these agents is preferable to the others.

The subject of Therapeutics was passed, and the report on Microscopy and Histology read by the chairman of that committee, Dr. T. B. Hitchcock.

Dr. Taft introduced Dr. Eastlak, of China, and on motion he was invited to participate in the discussions of the Association.

The report on Histology was discussed by Drs. Judd, Taft, Hitchcock, Morgan, Atkinson, Rehwinkel, J. S. Smith, and Chase.

Adjourned to 2 o'clock to-morrow.

THIRD DAY — AFTERNOON SESSION.

The Association met pursuant to adjournment.

In the absence of the President and Vice-Presidents, on motion of Dr. Goddard, Dr. Morgan was elected Chairman *pro tem.*

Dr. Walker offered the following resolution:

Resolved, By the American Dental Association, convened at Put-in-Bay, that the recent action of the railroad combination, refusing to make any reduction in fares, as far as it applies to dental, medical or scientific associations, is not only uncalled for but highly reprehensible.

Resolved, That gentlemen who attend such associations, as members or delegates, do so at great personal sacrifice for the benefit of humanity and the general public good, and that their influence tends greatly to advance the interests as well as the area of civilization, and thus to confer such positive benefit upon railroads (which depend upon the increase of civilization for their welfare), that they could well afford to pass such members and delegates both to and from their places of meeting, and that their refusal to grant at least

return passes is laying a tax, which they are illy able to bear, upon men who devote much time and labor, without compensation, for the public good, and is as short-sighted as it is arrogant and selfish.

Dr. Dean proposed to amend by striking out the last clause, which was lost. The main question was then put and the resolution adopted.

A volunteer paper on Histology and Microscopy was read and discussed by Dr. Atkinson.

On motion of Dr. H. A. Smith, Dr. Eastlak was invited to give a history of his experience and practice in China; whereupon Dr. E. gave a very interesting account of his professional life and the status of dentistry in China.

Dr. Rehwinkel offered the following resolutions, which were adopted:

In view of the fact that an urgent necessity does exist to supply the army and navy of the United States with competent dental surgeons, it is hereby

Resolved, That a committee of three be appointed to solicit and secure, first, the co-operation of the Surgeon General of the United States army, and, if needful, to memorialize Congress to make provisions for the appointment of dental surgeons to both the army and navy.

The following committee was subsequently appointed by President Buckingham: F. H. Rehwinkel, Geo. H. Cushing, J. H. McQuillen.

Resolved, That this Association, recognizing and appreciating the liberality of the Cincinnati, Hamilton & Dayton and Michigan railroads, and also the Cincinnati, Columbus, Cleveland and Indianapolis railroads, and the Short Line railroad from Louisville to Cincinnati (and other railroads conferring similar favors), in granting round-trip tickets to and from Put-in-Bay to members and delegates of the American Dental Association, hereby express its sense of obligations to the officers of the above named roads.

REPORT OF AUDITING COMMITTEE,

which, on motion of Dr. Stellwagen, was accepted and adopted:

Your Committee, having examined the Treasurer's account, with vouchers attached, find it to be correct:

Amount on hand at last report	$358.63
Amount received since last report	921.50
Total	$1,280.13
Amount of expenditures since last report	960.00
Balance on hand	$320.13

J. TAFT,
GEO. H. CUSHING.

The report on Dental Chemistry was called for, and a paper was read by Dr. Webb, a member of that committee. The subject was discussed by Drs. Atkinson, Buckingham, Summers, Taft, Osmond, Douglass, McLain, Knapp, Hitchcock, Hunter, Stellwagen, Palmer, Whitney, Corbin, Forbes, and others, and the subject passed.

The report of the Committee on Operative Dentistry was called. No member of that committee being present, and no report having been prepared, the subject was discussed by Dr. Hitchcock.

Adjourned.

THIRD DAY—EVENING SESSION.

Association met pursuant to adjournment; W. H. Morgan in the chair. The minutes of the previous session were read and adopted.

Dr. Taft moved that the Association proceed to the selection of the next place of meeting. Upon vote, Detroit was elected.

The result of the election for officers for the ensuing year was as follows:

President—T. L. BUCKINGHAM, Philadelphia.
First Vice-President—ISAIAH FORBES, St. Louis.
Second Vice-President—A. F. MCLAIN, New Orleans.
Corresponding Secretary—J. TAFT, Cincinnati.
Recording Secretary—M. S. DEAN, Chicago.
Treasurer—W. H. GODDARD, Louisville.
Executive Committee—GEO. L. FIELD, Detroit; G. R. THOMAS, Detroit; G. H. CUSHING, Chicago.

The President appointed G. H. Cushing and H. A. Smith Committee on Publication.

On motion of Dr. Cushing, the Treasurer was directed to pay the usual warrants drawn on him for the salaries of the Reporter, Secretary, and Treasurer.

Adjourned.

FOURTH DAY—MORNING SESSION.

Association convened pursuant to adjournment; Dr. Morgan in the chair. The minutes of the previous meeting were read and approved.

Discussion on Operative Dentistry was declared in order, and participated in by Drs. Judd, Hitchcock, Stellwagen, Herriott, Carroll, McDonneld, Taft, Knapp, Morgan, Chupein, and Smith.

On motion of Dr. Goddard, the question under discussion was passed, and the newly-elected President installed in office.

Drs. Sage and Cushing were appointed to conduct the President elect to the chair.

T. L. Buckingham being duly installed in office, the Committee on Mechanical Dentistry was called, and reports read by Drs. Herriott and Eames, and discussed by Drs. Honsinger and Herriott.

On motion of Dr. Stellwagen, the subject of Mechanical Dentistry was passed.

A gold medal having been sent to the President by the California State Dental Association, with the request that it be presented to Dr. S. C. Barnum by this Association, in behalf of that body, the President appointed Dr. C. C. Knowles, of San Francisco, to make the presentation, which he did in a most appropriate speech, which was feelingly responded to by the recipient.

The report of the Committee on Dental Education was called for, and read by the chairman, Dr. W. H. Morgan, and followed

by Dr. E. J. Waye, a member of that committee. Discussed by Drs. Morgan and Herriott.

On motion, Dr. C. Palmer was granted twenty minutes' time to explain a case of operating instruments.

Adjourned to 2 o'clock P. M.

FOURTH DAY—AFTERNOON SESSION.

The Association convened pursuant to adjournment; the President, T. L. Buckingham, in the chair. The reading of the minutes of the preceding session was suspended.

Dr. Judd offered the following:

Resolved, That the President appoint a committee of seven to take such measures as they may see fit to protect the interests of dentists and continue the work commenced by the committee of last year.

The resolution was adopted and the committee appointed as follows: H. Judd, St. Louis; E. Honsinger, Chicago; Louis Jack, Philadelphia; S. H. Noble, Washington; S. W. Dennis, San Francisco; H. A. Smith, Cincinnati.

Dr. Cushing, chairman of the Committee on Dental Literature, read reports prepared by himself and Dr. Bogue. The subject was discussed by Drs. Morgan, Atkinson, Hitchcock, Thomas, Wright (Pomaria), Stellwagen, Taft, Herriott, and Judd. On motion, the subject was passed.

Etiology was called. A paper was presented on that subject by Seneca B. Brown, a member of that committee, and read by the Secretary. Discussed by Dr. Judd and passed.

Verbal reports from the Committee on Local Societies were made by Drs. Judd, Taft, and Atkinson. The reports were received and the committee continued.

The Executive Committee reported names for standing committees, which was referred back, amended and adopted as follows:

STANDING COMMITTEES.

Physiology — M. S. Dean, E. A. Bogue, A. W. Harlan.
Pathology and Surgery — H. Judd, H. S. Chase, C. C. Knowles.
Histology and Microscopy — T. B. Hitchcock, C. E. Latimer, J. Taft.
Chemistry — H. A. Smith, C. R. Butler, W. T. Wallace.
Therapeutics — T. C. Stellwagen, L. Jack, J. McManus.
Operative Dentistry — L. D. Shepard, G. C. Daboll, G. L. Field.
Mechanical Dentistry — S. B. Brown, J. F. Canine, E. D. Swain.
Dental Education — A. F. McLain, G. W. Keely, E. J. Waye.
Dental Literature — W. H. Eames, Chas. Buffet, P. G. C. Hunt.
Dental Etiology — J. H. McQuillen, M. H. Webb, Jas. Johnstone.
Prize Essays — W. H. Goddard, Isaiah Forbes, G. F. S. Wright.

DR. WM. H. GODDARD, TREASURER, IN ACCOUNT WITH AMERICAN DENTAL ASSOCIATION.

Dr. August, 1872.		
To Balance, 1871		$358 63
Cash, dues, 1869	$ 5 00	
" " 1870	55 00	
" " 1871	160 00	
" " 1872	700 00	
" sale Transactions	1 50	
		921 50
		$1,280 13
Cr. August, 1872.		
By paid Voucher No. 1	$100 00	
" " No. 2	73 00	
" " No. 3	5 75	
" " No. 4	4 60	
" " No. 5	50 00	
" " No. 6	50 00	
" " No. 7	650 00	
" " No. 8	10 75	
" " No. 9	1 20	
" " No. 10	14 70	
		960 00
August 5th, 1873. Balance, cash in my hands		320 13
		$1,280 13

WM. H. GODDARD, *Treasurer.*

We have examined the Treasurer's Report, and find the same correct.

GEO. H. CUSHING, J. TAFT, } *Committee.*

PUT-IN-BAY, *August 7th, 1873.*

On motion of Dr. Cushing —

Resolved, That the necessary orders be drawn on the Treasurer for the payment of all current expenses, and that the Treasurer be instructed to pay the draft of the Secretary, countersigned by the President, to meet the expenses of the Publication Committee, when they shall be required.

Dr. Goddard offered the following, which was adopted:

WHEREAS, The printed copies of the constitution of this body are exhausted; therefore

Resolved, That the Publication Committee be, and hereby is, authorized to publish five hundred copies of the same, adding such amendments as have been made since 1869; and that the constitution be published with the coming Transactions.

[The latter clause was an amendment offered by Dr. Wright.]

Dr. Goddard moved a reconsideration of the vote whereby the amendment to Article IX, proposed at the last annual meeting, was rejected. Carried. The main question was then put and the proposed amendment adopted.

Dr. H. A. Smith presented the following resolution, which was unanimously adopted:

Resolved, That the thanks of this Association be, and hereby are, tendered to the proprietors of the Beebe House for the gratuitous use of this hall for the holding of its meetings; and also for the many kind attentions received from them during the present session.

Dr. Goddard proposed the following amendment to the constitution:

To amend Art. III, Sec. 3, thus:

SEC. 3. *Members to be of three classes.* The members of this Association shall be of three classes, viz.: Delegates, Permanent, and Honorary members; the two former classes having equal rights and privileges, except eligibility to office — none being eligible to hold office except permanent members; the latter class to consist of prominent worthy members of the dental profession residing in foreign countries, who shall be elected by ballot.

Dr. Keely offered the following:

Resolved, That a committee of three be appointed to carry into effect the resolution passed unanimously at Nashville, Tenn., viz.: to raise $1,000 to

present to Dr. S. C. Barnum, as a slight appreciation of his invaluable gift to the profession.

The resolution was adopted, and the following committee appointed by the Chair: Geo. W. Keely, Ohio; G. F. S. Wright, South Carolina; J. N. Crouse, Illinois.

Dr. Stellwagen moved to reconsider the vote whereby the amendment to Article IX was adopted. The motion was lost.

Adjourned to meet in Detroit on the first Tuesday in August, 1874, at 10 A. M.

AMENDED CONSTITUTION,

ADOPTED AT SARATOGA, AUGUST, 1869,

WITH AMENDMENTS UP TO AND INCLUDING THE SESSION OF 1873.*

ARTICLE I.

NAME.—This organization shall be known by the name of the AMERICAN DENTAL ASSOCIATION.

ARTICLE II.

OBJECTS.—The objects of this Association shall be, to cultivate the science and art of Dentistry, and all its collateral branches; to elevate and sustain the professional character of Dentists, to promote among them mutual improvement, social intercourse and good feeling, and collectively to represent and have cognizance of the common interests of the Dental Profession.

ARTICLE III.

SECTION 1. MEMBERSHIP. NUMBER OF DELEGATES FROM LOCAL SOCIETIES.—Each local society may send one for every five of its active members, and each Dental College one from its faculty, as delegates to this Association, for one year, upon complying with the requirements of its Constitution; but no society shall be entitled to representation that does not adopt or substantially recognize its code of ethics.

SEC. 2. EXPELLED MEMBERS.—Any member of this Associa-

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* All amendments to Amended Constitution are printed in italics.

tion, being expelled from his local society, shall from that date cease to be a member of this body.

SEC. 3. MEMBERS TO BE OF TWO CLASSES.—*The members of this Association shall be of two classes, delegates and permanent members, having equal rights and privileges, except eligibility to office, none being eligible but those who, upon signing the constitution and paying their dues, shall declare their intention of becoming permanent members.*

[The following amendment was proposed at the session of 1873, which, if adopted at the session of 1874, will take the place of the above section:

SEC. 3. MEMBERS TO BE OF THREE CLASSES.—The members of this Association shall be of three classes, viz.: Delegates, permanent, and honorary members; the two former classes having equal rights and privileges, except eligibility to office—none being eligible to hold office except permanent members; the latter class to consist of prominent worthy members of the dental profession residing in foreign countries, who shall be elected by ballot.]

SEC. 4. DELEGATES.—All delegates shall be practitioners of Dentistry: they shall receive their appointment only from permanently organized Dental Societies and Dental Colleges, having definite conditions of membership other than pecuniary, which shall have been approved by the Executive Committee, and a copy of which shall be in the hands of the Recording Secretary of this body.

SEC. 5. PERMANENT MEMBERS.—Permanent members shall consist of those who, having served one year as delegates, and complied with the requirements of the Association, shall signify to the Treasurer a desire for permanent membership.

SEC. 6. SIGNING CONSTITUTION.—Each new member before voting or speaking on any subject before the meeting, shall sign these regulations, inscribing his name, and the title and location of the institution from which he receives his appointment.

SEC. 7. DUES.—Five dollars shall be paid to the Treasurer by each member yearly, as dues, before he can be eligible to office, or speak or vote on any subject before the Association; and in case the dues remain unpaid at the close of the second annual meeting thereafter, the name of any such delinquent shall be erased from the list of members without further action.

SEC. 8. GIVING NAME ON RISING.—No one shall be permitted to address the Association before giving his name and residence, which shall be distinctly announced from the chair; nor

shall he speak more than twice, nor longer than fifteen minutes in all, unless by consent of the Association.

SEC. 9. CONDUCT OF MEMBERS.—Any act of special immorality or unprofessional conduct, committed by a member of this Association, shall be referred to the Executive Committee (second division), whose duty it shall be to thoroughly examine into the case, and report at the next meeting, if the charges be sustained. Whereupon, by a vote, the offending member may be reprimanded or expelled, a two-thirds vote being required for expulsion, a majority being sufficient for reprimand.

ARTICLE IV.

TIME OF MEETINGS.—The regular meetings of the Association shall be held annually, and commence on the first Tuesday in August. The place of meeting shall be determined each year by vote of the Association.

ARTICLE V.

SECTION 1. OFFICERS: HOW ELECTED.—The officers of this Association shall be a President, two Vice-Presidents, Corresponding Secretary, Recording Secretary, Treasurer, and the Executive Committee, who shall be elected by ballot without nomination. The *three* names, or in case of a tie, the *four* names, having the greatest number of votes, shall be the sole nominees in case of failure to elect on the first ballot, and a majority of all the votes cast for those names, shall be necessary to a choice.

Each officer, except as otherwise provided, shall hold his appointment for one year, or until another is elected to succeed him.

SEC. 2. PRESIDENT, DUTIES OF.—The President shall preside according to parliamentary usage, as laid down in Cushing's Manual, and the rules of order adopted by this Association.

SEC. 3. VICE-PRESIDENT.—In the absence of the President, one of the Vice-Presidents shall perform the duties of the office; and in the absence of these officers, a chairman *pro tem.* shall be appointed by acclamation.

SEC. 4. CORRESPONDING SECRETARY.—The Corresponding Secretary shall attend to the correspondence of the Association

with the societies therein represented, and to correspondence with other scientific bodies as may be desirable.

SEC. 5. RECORDING SECRETARY.—The Recording Secretary shall keep accurate minutes of the proceedings of the Association, preserve the archives and unpublished documents, and attend to the other duties that pertain to his office. He shall be *ex officio* chairman of the Publication Committee, and shall see that due notice is given of the time and place of meeting of the Association.

SEC. 6. EXECUTIVE COMMITTEE.—The Executive Committee shall be the business committee of the Association, and shall consist of nine members, to whom shall be referred all business not otherwise specially provided for. They shall report at each meeting, under the proper head, their doings for the current year.

SUB-COMMITTEES. FIRST DIVISION: COMMITTEE OF ARRANGEMENTS.—Three members of this committee shall act as the Committee of Arrangements, and shall procure suitable accommodations for the meetings and clinics, and for the exhibition and examination of appliances, of which they shall have the charge. *They shall also report to the Association upon any and all appliances which may be placed in their hands.* These three shall, if practicable, reside at or near the place at which the Association is to hold its next annual meeting, and shall attend generally to the wants of the Association during its session.

SECOND DIVISION: CREDENTIALS AND AUDITING COMMITTEE. Other three shall examine and verify the credentials and qualifications of members, including all violations of the code of ethics and the constitution, and shall also be the auditing committee for that year.

THIRD DIVISION: COMMITTEE ON NOMINATIONS AND VOLUNTEER ESSAYS.—The remaining three shall examine all volunteer essays, and before they are read to the Association shall give their approval, in order that time may not be taken up by unworthy or irrelevant matter.

They shall report names for the Standing Committees for the ensuing year, and the names of places for the next meeting.

PUBLICATION COMMITTEE: HOW APPOINTED.—Immediately after the election of new members to the Executive Committee, two from that committee shall be appointed by the President to

act in conjunction with the Recording Secretary, as the Publication Committee. They shall be authorized to employ a competent reporter to furnish an accurate report of the proceedings of each meeting.

INSTRUCTIONS TO THE PUBLICATION COMMITTEE.—They shall superintend the publication and distribution of such portions of the Transactions as the Association may direct, or the committee judge to be of sufficient value. They shall specify in the annual report of this committee the character and cost of the publications of the Association during the year, and the number of copies still on hand.

DISCLAIMER.—This committee is hereby instructed to print, at the beginning of each volume of the Transactions, the following disclaimer, viz.: "The American Dental Association, although formally accepting and publishing the reports of the various Standing Committees, and the essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when otherwise decided by special resolution."

REPORTS OF SUB-COMMITTEES.—Each of these sub-committees shall report from time to time, as may be necessary, to the Executive Committee as a whole, who shall decide upon such report if possible; but in case of their inability to decide upon any matter, it shall be brought before the Association for its decision as early as practicable.

CLASSIFICATION OF EXECUTIVE COMMITTEE.—At the first election of this committee, the first three shall be elected to serve three years, the second three for two years, and the last three for one year, and thenceforward three new members shall be elected each year by ballot, to serve three years, and in case of the absence of any member of this committee his place may be temporarily filled by the remaining members of the committee.

MEETINGS OF EXECUTIVE COMMITTEE.—The Executive Committee shall, if possible, meet for consultation and arrangement of their respective duties, on the day preceding the annual meeting of the Association, and shall meet for the examination of credentials, the arrangement of appliances, and the reception of papers, and such other business as may properly come before them, at 8 A. M., on the day of the annual meeting.

SUBDIVISION OF EXECUTIVE COMMITTEE.—They shall also meet, after the election of new members to the committee, to choose their own chairman and secretary, and to divide themselves into sub-committees, as hereinbefore provided, and for the purposes described.

CHAIRMAN MAY CONVENE THE COMMITTEE.—The chairman of this committee may, at his own discretion, summon the members thereof to a meeting, at any suitable hour during the sessions of the Association.

SEC. 7. TREASURER TO ATTEND, TO RECEIVE DUES, AT 8 A. M. —The Treasurer shall hold all the moneys belonging to the Association, and shall keep an accurate account as between the society and its members. He shall attend the meeting of the Executive Committee at 8 A. M., on the day of the annual meeting, to receive dues, and shall attend at roll-call to verify the list of names, checking all such as are in arrears for dues; he shall restore such names upon payment of dues within the legal limits, and shall notify all whose names may be erased from the list of membership. He shall pay the drafts of the President, countersigned by the Secretary, upon vote of the Society only, and shall report to the Executive Committee where his accounts shall be audited, and by whom his report shall be presented to the Association, together with their own.

ARTICLE VI.

SECTION 1. NAMES OF STANDING COMMITTEES.—The following Standing Committees of three shall be appointed at each annual meeting, to prepare, arrange, and expedite business in their several departments for the ensuing year, viz.:

A Committee on Physiology.
" Dental Pathology and Surgery.
" Dental Histology and Microscopy.
" Dental Chemistry.
" Dental Therapeutics.
" Operative Dentistry.
" Mechanical Dentistry.
" Dental Education.
" Dental Literature.
" *Etiology.*
" Prize Essays.

SEC. 2. DUTIES OF MEMBERS OF COMMITTEES.—It shall be the duty of each member of the Standing Committees to make an individual report, so far as such report can be made, and, in case of inability to be present at the meeting where that report is due, to forward it to the Recording Secretary, from whom it can be obtained by the chairman of each committee, respectively, at the time of assembling of this Association.

SEC. 3. DUTIES OF COMMITTEES.—Each committee shall report, if practicable, the results of original investigations in their several departments, and also such new matter, collected from all the sources at their command, as may be of interest and profit to the Association.

SEC. 4. COMMITTEES ON OPERATIVE AND MECHANICAL DENTISTRY.—The Committees on Operative and Mechanical Dentistry shall thoroughly test and report upon new modes and materials, and upon their physical properties, stating clearly why any particular mode of practice should claim attention, and giving tabulated lists of successes and failures so far as may be obtainable.

SEC. 5. PRIZE ESSAYS.—Two prizes of medals, not exceeding in value fifty dollars each, may be awarded to the best two communications reported on favorably by the Committee on Prize Essays, directed by the Association to be published.

ARTICLE VII.

QUORUM. — Fifteen members shall constitute a quorum for the transaction of business in this Association.

ARTICLE VIII.

SUSPENDING RULES: THREE-FOURTHS TO VOTE.—This order of business may be temporarily suspended by a three-fourths vote of all the members present, for the consideration of a specific subject, upon the completion of which the regular order shall be at once resumed.

ORDER OF BUSINESS.

1. Meeting of the Executive Committee, filling of vacancies therein, examination of credentials, and payment of dues, 8 A. M.
2. Organization of the meeting, 10 A. M.
3. Calling the roll of qualified members.

4. Reading of the minutes, and action thereon.

5. The reading and consideration of the stated annual reports from the Standing Committees, together with volunteer papers upon the same subjects, in their consecutive order.

6. Report of Executive Committee.

7. Balloting for the place of next annual meeting.

8. Election of officers and three members of the Executive Committee.

9. Appointment of Standing Committees.

10. Instructions to the Permanent Committees.

11. Unfinished, new, and miscellaneous business.

12. Adjournment.

ARTICLE IX.

AMENDMENTS.—"*Alterations and amendments may be made in the foregoing Articles or Rules of Order, at any annual meeting, by the consent of all the members present. Otherwise, notification in writing shall be made of any such proposed alterations or amendments, and laid over for one year for final action, when they can only be adopted by an affirmative vote of two-thirds of the members present.*"

RULES OF ORDER.

1. On the arrival of the hour of meeting, the President shall take the chair, call to order, and announce that the meeting is open for business.

2. No motion or speech shall be in order until the mover or speaker shall have been recognized and assigned the floor by the chair, nor shall a motion be open for debate until seconded and stated by the chair.

3. At the request of any member a motion shall be put in writing.

4. At the request of five members a question shall be divided, or the yeas and nays ordered.

5. When a question is under debate, no other motion shall be in order, except—1st, to adjourn; 2d, to lay on the table; 3d, the previous question; 4th, to postpone; 5th, to commit; 6th, to amend — and these motions shall take precedence in the order here stated.

6. The previous question, and the motions to adjourn, to lay on the table, and to postpone, shall be decided without debate.

7. A motion to adjourn shall be always in order, but no member can make such a motion while another is speaking, or while a vote or ballot is being taken.

8. A second amendment to the main question shall not be in order until the first is disposed of, nor shall there be an amendment of an amendment to an amendment.

9. After a motion has been seconded and stated by the chair, it shall not be withdrawn without the consent of the Society.

10. No member shall interrupt another while speaking, except to call him to order.

11. When called to order, a member shall sit down until the point of order is decided by the chair, or, in case of appeal, by the Society. If the point of order be sustained, the member can proceed in order by the consent of the Society.

12. Every member shall vote upon a question unless excused by the Society.

13. When any motion, except to adjourn, has been rejected, it shall not be renewed without unanimous consent.

14. Any member who voted in the majority may move a reconsideration of that question, but if that motion shall be lost or laid upon the table, it shall not be renewed without unanimous consent.

15. The President may vote with the members upon all questions, but having so voted, shall not give the casting vote in case of a tie.

16. Motions for filling blanks shall be put in the order in which they are moved.

17. On a division, or in voting by yeas and nays, any member may change his vote before the result is declared.

18. These rules may be suspended by unanimous consent.

CODE OF DENTAL ETHICS.

ARTICLE I.

THE DUTIES OF THE PROFESSION TO THEIR PATIENTS.

SECTION 1. The dentist should be ever ready to respond to the wants of his patrons, and should fully recognize the obligations involved in the discharge of his duties toward them. As they are, in most cases, unable to correctly estimate the character of his operations, his own sense of right must guarantee faithfulness in their performance. His manner should be firm, yet kind and sympathizing, so as to gain the respect and confidence of his patients; and even the simplest case committed to his care should receive that attention which is due to any operation performed on living, sensitive tissue.

SEC. 2. It is not to be expected that the patient will possess a very extended or a very accurate knowledge of professional matters. The dentist should make due allowance for this, patiently explaining many things which may seem quite clear to himself, thus endeavoring to educate the public mind so that it will properly appreciate the beneficent efforts of our profession. He should encourage no false hopes by promising success where, in the nature of the case, there is uncertainty.

SEC. 3. The dentist should be temperate in all things, keeping both mind and body in the best possible health, that his patients may have the benefit of that clearness of judgment and skill which is their right.

ARTICLE II.

MAINTAINING PROFESSIONAL CHARACTER.

SECTION 1. A member of the dental profession is bound to maintain its honor, and to labor earnestly to extend its sphere of usefulness. He should avoid everything in language and conduct

calculated to discredit or dishonor his profession, and should ever manifest a due respect for his brethren. The young should show special respect to their seniors; the aged special encouragement to their juniors.

SEC. 2. The person and office arrangements of the dentist should indicate that he is a gentleman; and he should sustain a high-toned moral character.

SEC. 3. It is unprofessional to resort to public advertisements, cards, handbills, posters or signs calling attention to peculiar styles of work, lowness of prices, special modes of operating, or to claim superiority over neighboring practitioners; to publish reports of cases, or certificates in the public prints; to go from house to house to solicit or perform operations; to circulate or recommend nostrums, or to perform any other similar acts.

SEC. 4. When consulted by the patient of another practitioner the dentist should guard against inquiries or hints disparaging to the family dentist, or calculated to weaken the patient's confidence in him; and if the interests of the patient will not be endangered thereby, the case should be temporarily treated, and referred back to the family dentist.

SEC. 5. When general rules shall have been adopted by members of the profession practising in the same localities, in relation to fees, it is unprofessional and dishonorable to depart from these rules, except when variation of circumstances requires it. And it is ever to be regarded as unprofessional to warrant operations or work as an inducement to patronage.

ARTICLE III.

THE RELATIVE DUTIES OF DENTISTS AND PHYSICIANS.

Dental surgery is a specialty in medical science. Physicians and dentists should both bear this in mind. The dentist is professionally limited to diseases of the dental organs and the mouth. With these he should be more familiar than the general practitioner is expected to be; and while he recognizes the superiority of the physician, in regard to diseases of the general system, the latter is under equal obligations to respect his higher attainments in his specialty. Where this principle governs, there can be no conflict, or even diversity, of professional interests.

ARTICLE IV.

THE MUTUAL DUTIES OF THE PROFESSION AND THE PUBLIC.

Dentists are frequent witnesses, and at the same time the best judges, of the impositions perpetrated by quacks, and it is their duty to enlighten and warn the public in regard to them. For this and the many other benefits conferred by the competent and honorable dentists, the profession is entitled to the confidence and respect of the public, who should always discriminate in favor of the true man of science and integrity, and against the empiric and impostor. The public has no right to tax the time and talents of the profession in examinations, prescriptions, or in any way, without proper remuneration.

REPORTS

OF

STANDING COMMITTEES,

VOLUNTEER ESSAYS,

AND

DISCUSSIONS.

REPORT OF THE COMMITTEE

ON

DENTAL PHYSIOLOGY.

By M. S. DEAN, Chairman.

THE physiology of the teeth and adjacent parts has received considerable attention by the members of our profession during the past year. And while I shall not attempt to present all the theories and facts that have been promulgated, not to say *originated*, I will place before you such new doctrines advanced as have come directly within my notice.

But before attempting this, I must apologize to this Association for the lack of preparation which must appear evident in this report; for, owing to causes which I could not control, this work had been delayed until it was too late for me to prepare anything like an elaborate or complete report upon this subject. Your indulgence is, therefore, asked for the omissions of matter it should contain, and for the faults in the matter it does contain.

Among the new theories that have come prominently to our notice is that advanced by C. S. Tomes, on "The Developmental Origin of the V-Shaped Maxilla," published in the June and July numbers of "The Monthly Review." In this paper he gives some new and interesting physiological facts in regard to the normal and abnormal development of the jaws; referring the V-shaped malformation back to the period of intra-uterine life. He shows that this peculiar deformity in the adult is nothing more than the necessary sequence of a malformation which occurred before birth, though at that time it would not be sufficiently marked to attract attention. This malformation in the adult jaw, he claims, is the

result of malformation in the fœtal jaw, which does not present, posteriorly, the slight divergence which exists in the case of normal jaws. The adult jaw retaining the same *form* that it did in its fœtal existence (with a slight increase in size), there will be, in this fœtal malformation alluded to, an angle at the point where the elongation posteriorly commences; that is, in the region of the second bicuspids, which accounts for this V-shaped deformity. As it is impossible for me to give you a clear idea of the author's views upon this subject, with this brief reference to it, I will refer you to the article itself, which you will find able and instructive.

In an Essay read by Dr. H. S. Chase, at the joint sessions of the Illinois and Iowa State Dental Societies, on the subject entitled "The part which vital action plays in the history of dental caries," a new physiological idea was broached — at least new to me — of which I will endeavor briefly to report. The point incidentally raised in that paper, to which I wish to call your attention, is so intimately involved with pathological questions as to render them inseparable. I will, therefore, give a brief synopsis of that portion of the paper relating to this point, in order that its physiological bearing may be more clearly apprehended.

The author claims: That the pressure — lateral pressure — of one tooth against another may produce *necrosis* of the enamel, thus causing the circulation of the blood-plasma to cease in its basal structure, and discoloration to take place in this tissue in consequence of this necrosis;

That the irritation or inflammation consequent upon, or simultaneous with, this necrotic process, causes a vital movement in the dentine which carries away the lime salts through the sound structure of the dentine to the blood-vessels of the pulp;

That when the dentine is reached, by a cutting instrument, under or immediately beneath this necrosed enamel, it is found to be softened and somewhat decalcified, but not discolored;

That in cutting a little further into this dentine, it is found still softer than that portion adjacent to the enamel, owing apparently to a greater decalcification of the tissue; and afterward the normally hard dentine is reached.

"In all this," he says, "there is evidently no loss of *basal* structure, either in the enamel or the dentine, but there is a loss of substance; and this is in the lime salts of the dentine." "It is

apparent," he continues, "that there has been no *external* loss of tooth substance. There has been no *chemical* process taking place, but there has been a vital movement in the *interior* of the tooth; in fact, among the tubuli themselves, resulting in the process called absorption. The calcareous elements have been carried away through the interior vessels of the tooth, and not by a chemical wasting away from the exterior."

In support of this theory, the author instances, among others, the following facts, which I will give substantially, though not seriately:

1. That absorption takes place in rare instances in the sound dentine under a perfect plug, to the extent even of exposing the pulp.

2. That the dentinal structure of the permanent teeth of adults may become less dense than they were at a former period, owing to interstitial decalcification having taken place.

3. That the two opposite processes — viz., calcification and decalcification — may and do take place in the hard tissues of the teeth.

4. That, in the teeth themselves, exostosis is sometimes caused by the irritation of a dead and decomposing pulp; and at other times absorption of the cementum and dentine of the roots takes place from the same cause.

The above are the main grounds upon which this theory is based, although I have not presented them as fully, nor perhaps as clearly, as the author would have done.

The same author, in the May number of the "Missouri Dental Journal," advances some views in regard to the absorption of the deciduous teeth that are, to say the least, both novel and ingenious.

In this article he affirms that the "absorption of dental tissue in deciduous teeth is a *retrograde* physiological process." "It is a work," he says, "done neither by the dental blood-vessels, the gum, a 'carneous body,' or by any other tissue or organ; but it is the work performed by the *tooth itself!*"

"The bone corpuscles of the cementum," he affirms, "change their shape and become connective-tissue cells." "The dentine tubes, also, are gradually changed into the same kind of cells as those of which they are composed before dentine tubes were formed, namely, connective-tissue cells."

"The same change takes place in the pulp cavity, the metamorphosis commencing next to the pulp; and the latter grows in size by a transformation of dentine tubes into connective-tissue cells of which the pulp is composed, and from which the dentine tubes were originally differentiated. At the bottom and sides of the alveolus the cells of connective tissue are gradually changed to bone-corpuscles, and then the inter-cellular space is filled with calcareous matter and true bone is formed."

The views advanced by this author, in regard to the absorption of deciduous teeth, lack sustaining evidence. Nevertheless, as before stated, they are novel and ingenious, and worthy of your careful consideration; for although histologists and physiologists are generally agreed in the fact that the absorption of these teeth is accomplished by forces *external* to the tooth, differing only in their theories as to the *mode* of operation; yet on this latter point, at least, they possess no certain knowledge, and their theories are of no greater value than those of the author above quoted.

A theory has been advanced — or rather, a statement has been made — by Dr. Garretson, in regard to the development of the enamel, in his second edition of "A System of Oral Surgery," which is new, at least to the writer, and is, I think, deserving of notice. He says, on pages 105–6: "The formation of dentine completed, the covering of it with enamel begins; or rather, this deposit is, to a degree, coincident with the dentinal formation. Secreted by the *same pulp* which formed the dentine, the same secretion, some portion finds its way into and through the primary sac. As it passes through this sac it is modified, receives new elements, perhaps, which, as it is received into the second space, or the space between the first and second caps, impresses upon it the arrangement of its particles after the hexagonal order of the enamel. Between the enamel thus formed and the dentine, exists the primary sac; simply the originally modified mucus membrane, which we first saw as overlying the papilla. This membrane continues its existence between these two hard bodies, and receives and modifies, for the support of the enamel, the liquor sanguinis exuded from the dentinal tubules and inter-tubular structures. It may be called the enamel membrane. It has of course been much modified; it is from it that we receive the impressions of pain when becoming exposed by a break in the continuity of enamel," etc. etc.

These are the peculiar views of Dr. Garretson in regard to the development of the enamel, pretty fully quoted. He does not, however, give us any demonstrative evidence — in fact he gives us no evidence — in support of this new doctrine. But that it is not purely speculative, we are led to infer in a succeeding paragraph, in which he says: "The observations leading to the conclusions have been somewhat extensive, and the phenomena seem certainly indorsed by general physiological analogy."

This theory in many respects is a plausible one, and your Committee regret that "the observations leading the author to these conclusions" were omitted in this work. Although at the first reading this theory appeared absurd to the writer of this report, yet on second thought he finds some reasonable grounds for the support of this view. If the observations of Tomes are reliable — — and I believe histologists pretty generally agree with him on this point — the dentinal fibers often extend into the substance of the enamel. This fact, as far as it has any significance in relation to the development of the enamel, would, to my mind, favor the theory of Dr. Garretson. Again: It is admitted, generally, that the enamel, *after* the tooth has been erupted, becomes more fully developed, receives an additional supply of calcareous salts, and also that the enamel, after it has become fully developed, is the recipient of nutrient matter. Now, from whence is this developing material and this nutrient matter derived? Most assuredly from the dental pulp. If this power resides in the dental pulp *after* the enamel organ has disappeared, it would seem *possible* that it may possess the formative power ascribed to it by Dr. Garretson.

But there seem to be physical difficulties in the way that render this theory highly improbable. It is a well established histological fact that the enamel and dentine are developed in opposite directions, the dentine being formed by the deposition of new layers from without inward, while the enamel is formed in a similar manner from within outward.

According to Dr. Garretson's view, the formative material, after the process of development has *commenced*, would have to be conveyed not only through the formed portion of the dentine but also through the formed enamel.

But my object is not to refute or confirm any physiological doctrine that may be presented in this report, but to throw out

such suggestions as may occur to me at the moment of writing. I regret that the author, who asserts that he considers his theory "*irrefutable*," did not think it worth while to present his readers with some of the many observations that led him to his conclusions.

I will now call your attention to a paper presented by myself at a recent meeting of the Illinois and Iowa State Dental Societies upon the subject — "May the calcific elements of the deciduous teeth be appropriated in the formation of any portion of the permanent ones?" — which, slightly abridged, is as follows:

If we take a comprehensive survey of the general features of this subject, simply in the light of common sense, we shall be struck with amazement at the *economy* which manifests itself everywhere in the construction and maintenance of each individual part of the human body. In the formation of the osseous system, for instance, we shall see lightness combined with inflexibility and strength; and wherever it becomes necessary to use the bones for fulcrums or as attachments for the muscles, their bulk is increased, while their weight and strength still retain their just proportion to the other parts. In short, they are composed of materials so arranged that the least possible quantity of matter will yield the greatest amount of durability and strength.

Then, again, we shall observe that the *supply* of materials that is furnished for the growth and repair of the organs is used with scrupulous economy. No portion is lost or allowed to go to waste. To guard against this waste of material, the system is traversed by a host of little gleaners — the lymphatics — which gather up from the interstitial parts all the strayed exudations, and carry them into the general circulation; so that nothing which can be assimilated or appropriated by any organ or tissue is permitted to go to waste, or escape from the system as excreted substance, unless there be an excess of these ingredients in the system.

Now, as a familiar example illustrative of the *economy* with which the system may use the *inorganic* materials introduced in the food, the management and disposition of common salt affords an excellent one. And upon this point I cannot do better than quote the words of Draper, who, I believe, expresses the opinion of physiologists generally upon this subject. He says: "Oxide of sodium, or soda, is a uniform ingredient of the bile.

The hydrochloric acid of the gastric juice, and the soda of the bile, are derived from the same source — common salt — which is either present in the food or purposely added as a condiment. * * * Considering the large quantity of these secretions produced in a short space of time, it is clear that the drain of common salt must be great — not less than a third of an ounce a day; yet the quantities consumed, at least, are only small. How, then, is this explained? Assuredly, there is no other source from which these bodies can come than the one indicated — the common salt — and yet it seems to be totally inadequate." He says further: "I think this difficulty is rather imaginary than real. Things are so arranged that a limited quantity of salt can produce unlimited quantities of gastric juice and bile; for the former, associated with the food it has digested, scarcely escapes from the pyloric valve before it encounters the bile and pancreatic juices discharging into the duodenum, and through the length of the upper portion of the small intestines these secretions, together with the food they have acted upon, are brought into complete contact. The reproduction of chloride of sodium is, therefore, constantly taking place in intestinal digestion, and it returns back into the system through the absorbents. Again, it undergoes decomposition, its acid reappearing in the gastric juice, and its alkali in the pancreatic juice and bile. By thus using a small amount over and over again, great effects can be produced, and it is then only necessary to restore those small portions that are wasted in carrying out the general scheme."

Here Draper has given a beautiful illustration of the wonderful economy with which the system may use the *inorganic materials*.

Were all the elements introduced in the food incapable of further use, after having served one purpose in the system, the body would be overloaded by the mass of materials it would have to carry, to such an extent, perhaps, as to nearly deprive the animal of locomotion.

From this general view of the *providence* and *economy* of nature, it is unlikely, *a priori*, that the rich supply of calcific matter taken from the deciduous teeth should be allowed to escape from the system as waste, especially when the same kind of materials is needed for growth or repair in many parts of the body.

Now let us for a moment examine the nature of the materials

removed by the absorbents from the deciduous teeth, and see whether they are capable of being re-employed.

In the first place, they are living materials, in one sense at least, although Beale calls all "formed material" dead material. But I shall apply the term *living* material to the ingredients of teeth in which the pulp is not devitalized, to contradistinguish it from the constituents of teeth in which the pulp is dead.

These materials, in the deciduous teeth, are not absorbed *on account* of their degeneration; they are not taken away by these vessels *because* they have become disintegrated, and thereby rendered less capable of performing their functions in the tissues or organs, of which they are constituent parts, than they were *before* the absorbents seized upon them and dissolved their combinations. But these materials — these teeth — are taken out of the way, because they are a physical obstacle that must be removed, in order to give room for their stronger and more enduring successors.

The removal of these materials is the result of physiological or vital action, and is not a pathological nor a chemical process. If it were the latter (chemical action) the pulpless or dead teeth might also be removed by the same process. The dead teeth, though they yield as readily to the action of chemical agents as do the living ones, resist effectually and totally the absorbent forces of the papillæ. These materials, then, are living undegenerate matter, taken up by vital or physiological forces, and carried into the circulation, and there can be no reason whatever for supposing they have become unfit pabulum for other tissues. Some may contend that the lime salts taken from these teeth have lost their connection with the organic matter with which they have been intimately associated, and, for this reason, cannot be appropriated by the tissues. They may take the ground that the phosphates have become disorganized, so to speak, and that these identical ingredients cannot be again assimilated until they have become reorganized, as it were, in the vegetable form, and in that form enter the system again. This objection to the use of the calcareous elements of the deciduous teeth is, I think, utterly groundless, even if they had lost their intimate union with organic matter; for it is altogether probable that the crude phosphates may form this connection with organic matter *within the system*. But if we grant that this combination cannot be effected internally, it by no means

proves that these calcific elements cannot be appropriated by the tissues, for all the authorities I have noticed upon this point agree that the phosphates leave the body in the same form in which they enter it in the vegetable food. If this be the case, the objection to the reappropriation of these materials, on account of the disintegration of the organic matrix, or their separation from organic matter in which they have been held, is without a shadow of foundation.

That this waste of the lime salts of the deciduous teeth would be contrary to the economy of nature, I think I have already shown; and that it is contrary to other analagous processes in nutrition, I think I shall be able to furnish sufficient evidence.

The opinion of physiologists generally is by no means adverse to this view. Lionel S. Beale says: "In the formation of muscle, for instance, from lifeless nutrient pabulum in the blood, the matter which is to become muscle passes through these different conditions:

"1. That of a soluble nutrient matter, or pabulum.

"2. Germinal matter, nucleus.

"3. Imperfectly developed formed material.

"4. Fully developed formed material, muscular contractile tissue.

"5. Disintegrated formed material, which becomes slowly reduced to a soluble state, and is converted, by oxidation, into new substances, some of which pass away, while others in their turn become pabulum for other kinds of germinal matter, such as the white-blood corpuscles and the lymph corpuscles."

Here Beale makes the direct statement that some of the disintegrated muscle tissue may be used again as pabulum for germinal matter. And as far as his authority goes — and I believe there is none greater — the question is already settled that materials which have been used in the formation of one tissue may be afterwards appropriated by others. Dunglinson, Carpenter, Dalton, Flint and Paget, as far as their testimony goes, indirectly confirm this statement of Beale, though they are more reticent on this point than Draper, who iterates the same sentiment in these words: "The constitution of the urine proves that the amount of muscular fibrin destroyed in short periods of time is very great. We cannot estimate the hourly consumption at less than 62 grains. Such a waste must demand an equivalent compensation, if the animal mechanism is to be kept unimpaired; and every care is therefore

taken to omit no means which may incidentally offer for husbanding the necessary materials. The action of the lymphatics illustrates this principle significantly. Passing through all the soft solids, where exudation of albumen from the blood-vessels can take place, they collect the materials that would otherwise go to waste, and add thereto many of the products arising from disintegration and decay of the soft parts themselves."

In regard to the development and maintenance of the adipose and osseous tissues, he says: "From the phenomena of nutrition generally, we may conclude that there are several sources from which *materials* for these purposes may be derived; a part may be obtained directly from the food; a part may be manufactured or fabricated in the system itself, or *may be taken from some locality therein*, in which it has become redundant or useless, and transferred elsewhere to the point at which it is required."

Again, he says: "In the adult the sources of bone-earth are twofold; in part it is derived from the food, and in part from the remodeling and changes of the bones themselves."

The same author makes the following clinching statement, which, if possible, is still more to the point: "As to the sources from which phosphate of lime are derived, though doubtless the food offers it in considerable quantity, there are many reasons for inferring that the identical portion which has been removed from one part is used for the extension of another; and thus we may say that there is a plastic operation continually going forward, a remodeling, so as to adapt the structure to its new conditions if in a growing animal, or to maintain it in good repair if in an adult."

These statements of Beale and Draper, if worthy of credence, are sufficient analogical evidence to satisfy me that the calcific elements of the deciduous teeth may be appropriated in building up portions of the permanent teeth, or any of the other tissues of the body that require calcareous elements.

So also Liebig: "It is obvious that the phosphoric acid which in consequence of the metamorphosis of tissues is produced in the form of soluble alkaline phosphates must re-enter the circulation of this class of animals (the graminivora). It is then employed in forming brain and nervous matter, to which it is essential, and also, no doubt, in contributing to the supply of the earthy part of the bones. In the graminivora, therefore, whose food contains so

small a portion of phosphates, the organism collects all the soluble phosphates produced by the metamorphosis of tissues, and employs them for the development of the bones and the phosphorized constituents of the brain; the organs of excretion do not separate these salts from the blood."

We have seen from the foregoing —

That the process of nutrition is carried on in an exceedingly prudent and economical manner; that the elements taken from the deciduous teeth by the absorbents are not degenerated materials, nor unfit pabulum for other tissues; that the inorganic substance — common salt — may be used over and over again, subserving an important purpose in nutrition, until it is gradually lost with the excrementitious matters. We have seen that portions of the disintegrated muscles, which are composed almost entirely of organic matter, may be converted into pabulum for other tissues; that the same identical phosphates may be used indefinitely by animals whose food is deficient in this essential ingredent; and finally — which is still more significant — we have seen that these lime salts, of the deciduous teeth, are taken into the circulation at the period of life when these elements are the most imperatively demanded in the *growth* of the young animal.

If these positions have been maintained, we have an abundance of analogical evidence to conclude that the calcific elements of the deciduous teeth may be, and are, appropriated by the incomplete parts of the permanent teeth, or by any other tissue which may require these constituents as pabulum.

BOSTON MEDICAL
JUN 29 1891
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REPORT

ON

PATHOLOGY AND SURGERY.

By H. JUDD, Chairman of the Committee.

IN the report of this Committee for 1872, attention was particularly called to the limit of our knowledge relating to the causes of disease. It was found that but a few of the diseases in the long catalogue could be pointed out whose causes had been definitely determined. Some etiological doctrines, which might be designated as parasitic, were cursorily discussed; and since our last convocation we find that the public mind has been steadily verging toward that point on the scientific horizon which indicates that the parasitic theory of disease is to be, in the immediate future, the most prominent of the theories which have yet been broached upon this subject. Several works, bearing more or less directly upon this subject, have been pretty generally disseminated during the last year, and it will perhaps repay the labor of bestowing upon them a passing notice. The first and most prominent of these is *Sansom on the Antiseptic System*, and, secondly, we have Leber and Rottenstein principally upon caries of the teeth; whilst Wedl's work upon the *Pathology of the Teeth*, having been translated and placed in the hands of the profession generally, has been studied to a considerable extent, and is doubtless having its proper influence in shaping the pathological ideas and opinions of those who have conned its well written pages. Of these works, Sansom's treats of Etiology — only incidentally, but it is none the less interesting or valuable on this account, as it cannot be so readily supposed that facts which have reference to this subject are as liable

to be distorted from their legitimate use, as is too often the case when authors have constructed a theory and then attempt to make all known facts harmonize with and support it.

In the preface the author makes the following statement: "As regards the nature of the causes of infectious diseases, it will be seen that I go with him (Dr. Beale) to his penultimate but not to his extreme conclusions. * * * From a review of all the facts and observations, I have been led to enunciate the theory that the poisons of spreading diseases are extremely minute living organisms, having the characteristics of vegetable growths, analogous to the minute particles of vegetable protoplasm, whose function it is to disintegrate and convert complex organic products; owing their specific properties, in the special diseases, not to any botanical peculiarities, but to the characters implanted in them by the soil in which they first sprang from innocent parents, and from which they are transmitted — this soil, except in the case of their earliest origin, being the fluids of the animal body."

The points to which we would particularly call attention in this enunciation of theoretical views are: *First.* That spreading diseases are due to the action of minute living organisms; *secondly*, that these organisms have the characteristics of vegetable growths; and, *thirdly*, that their specific characters are not due to botanical peculiarities, but to characters communicated to them by the soil in which they first originated — the soil, except in the case of their earliest origin, being the fluids of the animal body.

The first of these propositions, so far as certain diseases are concerned, will, as a general thing, be conceded to be true without controversy. As to the second, the author is careful not to state positively that they are vegetable forms, but we are led to believe that he regards them as such, though the evidence upon that point is not sufficiently demonstrated to warrant an unequivocal statement of that character.

Beale holds that, so far as the cause of contagious fevers are concerned, they are not produced by vegetable forms, but by living animal matter, which originates in the animal body, and which has descended from a bioplasm which was originally in a healthy state. We do not consider this difference of opinion between Beale and Sansom, as to the vegetable or animal feature of the causative agents, as of very great importance, as it is scarcely pos-

sible to distinguish the one from the other in these low forms of life. Sansom lays much stress upon the fact that these causative agents simulate the various ferments very closely, and that they are therefore vegetable; but Williamson has lately shown very good reasons for believing that these ferments are themselves animal, instead of belonging to the vegetable world, as has been generally supposed.

The third proposition involves within itself problems of extreme interest, in a philosophical point of view, the principal feature of which approaches very nearly a corollary which naturally flows from Beale's proposition, that these living agents, in the production of contagious fevers, were descendants of a living bioplasm, which was perfectly healthy, and which was not able to communicate this or any other form of disease.

The question which arises here for solution is, Can a vegetable or animal germ be so influenced by surrounding circumstances as to determine its development into a vegetable or animal form which shall differ essentially from the parent stock?

Both of these statements would indicate that these authors suppose this to be possible, and that the germ of one species may be developed into a form which clearly belongs to another species without resorting to those slow and equivocal influences which figure in Darwin's doctrines of natural selection to bring about this specific change, for Sansom reports several cases in which this actually takes place. Trecul and Hallier are quoted to show that pennicilium, cultivated from lemon, was developed into yeast cells, aspergillus, ascophora, etc.; whilst mucor and palmella have also produced yeast cells, by a peculiar cultivation. If these different species may be thus produced from the same germs, who shall be able to say where these changes will be limited? Can we not reasonably suppose that if these changes do take place, as here stated, in species, generic changes may also be brought about by surrounding the developing germ with other conditions, differing more widely still from those which would seem to determine its development in its ancestral form?

Though there seems to be some evidence in favor of the views put forth by Beale, relating to this question, still it has not yet been clearly demonstrated that such changes can be thus wrought in living beings as to so completely change their nature that the

offspring of a healthy bioplasm shall become, whilst still living, capable of propagating other living beings, which are deadly poisons to the parent stock. We do not, however, propose to spend time in theorizing upon this subject, but only desire to bring before the Association the doctrinal points bearing upon the cause of disease which are found in this work; and as the propagation of one vegetable from a germ which belongs to another species seemed to point to the same law as the one indicated by Beale, we have taken the liberty of placing them side by side for examination. It is possible that these seeming vegetable mutations may be accounted for by applying the well-known law of intermedial forms which obtain frequently in the lower orders of the animal creation during the developmental process.

Leber and Rottenstein have enunciated no doctrine which can be declared to be entirely new in their book upon the causes of caries, but they have collected facts connected with investigations upon this subject, and have used them very fairly, we think, in support of their theory of caries, which recognizes the leptothrix buccalis as an active agent in the progress of this disease.

Experiments also instituted by themselves seem to confirm this view. They do not, however, believe that this parasite is capable of producing caries in teeth, but attribute the initiatory steps to the action of acids. They find this parasite in the dentinal tubuli in nearly all cases of soft caries, whilst in dry caries they think acids may be the sole cause. By experiment they find that this parasite flourishes most luxuriantly in acid solutions. They likewise believe that lactic acid is the one most commonly found in the mouth, and that this is usually formed in the oral cavity.

Wedl's views were hinted at in the last yearly report of the Committee. It is well known that he is not in accord with Leber and Rottenstein upon this subject. He acknowledges, however, that fungi are nearly always present in soft caries; that they penetrate into the dentinal tubuli; in fact, he plainly states that "the proliferations of the elements of the fungus without doubt penetrate and expand the dentinal canals; but according to my observations this cannot occur until the decalcification of the dentine is complete, or at all events until the beginning of this process."

Now if these fungi penetrate and expand the dentinal canals, it seems evident that they must exert some influence in determining

the extent and direction of the carious process; and this is about all that is claimed for them by Leber and Rottenstein.

Now, if they expand the dentinal canals, it is at once evident that the fluids of the mouth will come more readily in contact with the dentinal structure, and as an inevitable consequence — when acid — they will accelerate the process of decay. In another place he says: "If the continuity of the enamel membrane is interrupted by fissures in the enamel, or has become brittle or friable, in consequence of the presence of leptothrix masses," etc. Now, if leptothrix masses may cause the enamel membrane to become brittle and friable in consequence of their presence, how is this change in the membrane brought about? From our knowledge of the habits of fungous growths we should answer: By drawing their sustenance from the structure of the membrane and preying upon the corny cellular elements of which it is composed. If, then, these leptothrix masses are capable of preying upon and destroying the integrity of the structure, why may they not also prey upon and destroy the organic matter found in the dentinal structure? In view of all the evidence adduced, we are inclined to the opinion that these masses of leptothrix do exert an active influence in the process of dental decay.

In this connection it seems proper to call attention to Mr. Hutchinson's work upon *Syphilitic Diseases of the Eye and Ear*. Referring to the symptoms of hereditary syphilitic disease in children, the author says: "By far the most reliable amongst the objective symptoms is the state of the permanent teeth." He states that although the deciduous teeth may present peculiarities they show nothing which is pathognomonic. The central incisors of the second set are, according to this author, the test teeth. He states that in syphilitic patients these teeth are usually short and narrow, with a broad vertical notch in their edges, and their corners rounded off. Horizontal notches or furrows are often seen, but these have nothing to do with syphilis.

Many cases are reported by the author which have fallen under his observation, and which seem to support his theory. Nevertheless we must remember that Mr. Hutchinson is a surgeon in a London hospital, and attends principally to syphilitic patients; and it may be possible that, as in the case of the Lostorfer syphilitic corpuscles, these notched teeth will be found in other forms

of disease. If the attention of the dental profession be turned to this subject it is to be hoped that this question will be set at rest as satisfactorily as was that of the Lostorfer corpuscle by the subsequent investigations of Stricker.

A discovery made by a Dr. Lewis bids fair to result in the establishment of the cause of one more disease whose etiological relations have heretofore been unknown. It is found that in chyluria, a disease quite prevalent in Brazil, and also, we believe, in some parts of the East Indies, a parasite of the species filaria is always found in the blood. Although there can be but little doubt as regards the relation of the disease to this hæmatazoon, still, more observations are needed to place it beyond all doubt. From the great prominence which has been given to this doctrine of the parasitic causation of disease in this, and especially in the report of last year, it might be inferred that the production of disease by other causes was to be entirely ignored.

Whilst disclaiming all such intentions, we are, however, ready to admit that nearly all progress toward the solving of the mysteries connected with these etiological questions has been made in this direction, and hence the prominence given in these reports to these causative agents.

Leaving this branch of the subject with the foregoing remark, we proceed to an examination of some of the phenomena of disease. Interesting questions relating to pathological processes present themselves for discussion on every hand. Inflammation has ever attracted the attention of investigators, and has ever held a very prominent position among diseased conditions. No study connected with pathological research has ever presented more points of interest than this. Mr. Paget states, in his lectures upon *Surgical Pathology*, that "it is no more than the truth, which Mr. Travers has well expressed in his work on the *Physiology of Inflammation and the Healing Process*, 'that a knowledge of the phenomena of inflammation, the laws by which it is governed in its course, and the relations which its several processes bear to each other, is the keystone of medical and surgical science.'" J. Bourdon Sanderson, who wrote the article on inflammation in the last edition of *Holmes' Surgery*, defines inflammation as follows: "By the process of inflammation I understand the succession of changes which occurs in a living tissue when it is injured, provided that the

injury is not of such a degree as at once to destroy its structure and vitality."

Rindfleisch, in his *Pathological Histology*, upon the same subject, says: "If the organism is injured, or meets with any other sufficiently powerful irritation at any point, this has, as a consequence, for the point nearest affected, a series of changes which we designate as the inflammatory process." We propose to spend a short time in the examination of some of the phenomena presented in inflammation, the processes which take place, and the structural changes which ensue. We do not propose to examine all of the phenomena which have been described by authors, but it is our purpose to delineate particularly certain appearances which have given rise to discussion, as different results seem to have been attained by different observers in their investigations. It had been observed that, when a living tissue was irritated, contraction of the vessels of the part took place; and this was generally conceded to be the first visible phenomenon presented in the inflammatory process. Keeping watch of the vessels of the irritated part, it was observed that after a certain time the vessels began to dilate, and this process of dilatation went on until they were found to have reached a size much larger than they were in the normal state. Various speculations were indulged in to account for this distension of the vessels, the favorite of which was that it was due to an exhaustion of the contractile power of the muscular fibers in the walls of the vessels, consequent upon the previous contraction. Subsequent observations established the fact that whilst the vessels in some cases remained contracted for hours, in others the contraction was evanescent, and dilatation soon supervened. Pushing the investigation still farther, it was finally conceded that in some cases the contraction and subsequent dilatation took place so nearly together that the contractile period could not be easily seen; and one step farther in this direction led to the doctrine generally held at this day, which declares that dilatation takes place as a consequence of irritation, in many cases without any previous contraction of the vessels. It will at once be seen that the establishment of this fact necessitates an abandonment of the previous doctrines relating to the philosophy of the dilatation. It might be remarked, in explanation of these changing theories, that they were both formed upon correct observations, but the source

of error in the former consisted in coming to general conclusions from data which were too limited to warrant them. The fact that irritation of a part sometimes produced a contraction of the vessels by no means proved that every kind and degree of irritation produced this result. So far as is known at this day, the dilatation of the vessels of the part is the first constant visible phenomenon in inflammation of vascular tissues, and perhaps of non-vascular tissues also. It has been objected that, as inflammation takes place in non-vascular tissues such as the cornea, in such cases it is impossible that a dilatation of the vessels of the part should take place. But it is observed by Mr. Paget that in such cases dilatation of the vessels lying adjacent to the parts takes place; and as these are the vessels which carry nutritious material to these tissues, they are in reality the vessels of the part, though they are not in the part, which is inflamed. We would suggest, however, that though there are no vessels which carry red blood in the cornea, still there are channels which convey the serum of the blood to this tissue; and it is well known that these vasaserosa do dilate, during the time that the part is inflamed, to such extent that red blood circulates freely through these serous channels. Another appearance presented which has given rise to conflicting opinions is the change which takes place in the motion of the blood. It was formerly generally held that there was an acceleration of the motion of the blood when there was a contraction of the vessels, and many ingenious theories were constructed to explain this phenomenon; but instead of explaining it, at this day pathologists are nearly unanimous in the belief that the blood stream is actually slower when the vessels are contracted than it is in the normal state, whilst an acceleration of the current takes place when dilatation first commences, but that it then gradually grows slower and slower until stagnation supervenes; but the cause of this retarded movement and final stasis is not fully understood. A third point in the study of inflammation relates particularly to the infiltration of the tissues of the inflamed part with fluids and corpuscular elements which are derived from the blood. The principal controversy in relation to this infiltration has arisen in reference to the corpuscular or cellular elements found in it, and which were formerly known as exudation corpuscles. Virchow supposed they were produced by a proliferation of the stable connective tissue

corpuscles; but when von Recklinghausen discovered the wandering cells in connective tissue, and demonstrated their migratory habits, and when the doctrine, propounded by Addison in 1842, and by Waller in 1846, and still again by Cohnheim in 1868, finally made its impress upon the public mind, it began to be recognized that these exudation corpuscles were leucocytes which had escaped from the vessels and become wandering cells, and that when the inflammatory action progressed to a certain point they became pus corpuscles. The opposing doctrines then, relating to the origin of the pus cells, were: that of Virchow, who referred them to a proliferation of the fixed connective tissue corpuscle, and that of Cohnheim, who contended that they were white blood corpuscles which had escaped from the vessels.

This controversy seemed for a while upon the point of being decided in favor of Cohnheim's theory; but the observations of Stricker and others established the fact that the fixed cells of the connective tissue do sometimes proliferate, and it is now generally conceded that, although a great majority of pus cells do escape from the vessels in the form of leucocytes, some are also derived from the other source.

As it is now well settled that leucocytes become pus corpuscles, the question very naturally arises as to the time in the history of this organism when this change takes place, and likewise as to the nature of the change. The microscope fails to respond to this demand made upon its almost illimitable powers. That there is a difference between the two is evident. The leucocyte is capable of being organized into other tissues, whilst the pus cell has no such potentiality. If the pus cell is a degenerated leucocyte, how far has the degeneration to proceed before it should be called pus? Although it would seem that the degeneration suffices to unfit it for organization, it has not proceeded far enough to unfit it for proliferation, for the capacity of pus cells to multiply themselves seems to be well established; consequently they are not dead leucocytes. The intimation put forth by Paget, that the commencement of a fatty degeneration in the corpuscles marks the line between the leucocyte and the pus corpuscle, is totally unsatisfactory, and rests upon no data sufficiently authentic to entitle it to credit, whilst it is opposed by the probability that when leucocytes

have degenerated so as to manifest a fatty metamorphosis, their proliferatory powers will already have been lost.

Among the processes which take place during the course of an inflammation is a breaking down of the connective tissues of a part, especially in case of the formation of abscess. After tissues are thoroughly infiltrated with the inflammatory exudation, the corpuscular elements gather together and the connective tissue elements dissolve or break down, and the space thus formed fills with pus. What determines the point of convergence, and what force moves the cells to this common center? And again, we would ask, what determines the liquefaction of the connective tissues at this point? Is the dissolution effected by the action of the cellular elements which become pus corpuscles, or is it caused by an interference with the circulation of the blood in the part, thus depriving it of its nutritive material?

In relation to the first question, Rindfleisch states that the spontaneous mobility of the cells is brought into play. We have become accustomed to speak of this spontaneous motion of leucocytes, but in our anxiety to explain every mystery we may press this doctrine too far; for whilst acknowledging their locomotive powers, we hesitate to endow them with that half-reasoning consciousness which would be required to direct their course and guide them to a common center. Nor can we see clearly how a transudation from the vessels could suffice to determine the point of the accumulation as suggested by the above-mentioned author. This author also inclines to the view that the dissolution of the tissues in case of abscess is due to a disturbance of the nutrition of the part.

J. Bourdon Sanderson says, in relation to these questions, that they cannot as yet be satisfactorily explained, but remarks that the leucocytes seem to have a tendency to move away at right angles from the long axes of the vessels from which they have escaped; and he also remarks that they have the power of surrounding concrete matter with their own substance, and dissolving it; and further on he states that "It has not yet been demonstrated that these leucocytes actually prey upon the nutritious constituents of the slough, but it certainly appears as if they determined its liquefaction." In relation to the structural changes which ensue in the formation of abscess, we would also notice a structural

change which takes place around the central focus, and which is brought about by an organization of the inflammatory infiltrate of that part which, instead of breaking down into pus, forms a new connective tissue within the interstices of the old tissue elements; and this has been designated in certain locations as an enveloping sac. An illustration of this may be seen in abscesses located at the apices of the fangs of teeth; that is to say, in alveolar abscesses. After an abscess has been opened, and the pus evacuated, organization takes place close to the limits of the abscess, and, as Rindfleisch has it, "embryonal connective tissue quickly forms," which thickens, and upon which granulations appear; from which, according to the last-mentioned author, are produced skin, epidermis, vessels, etc.

The production of vessels in these new formations takes place rapidly, whilst the formation of nerves, lymphatics, etc., takes place more slowly.

It has been a mooted question whether epithelium can be produced from granulation tissue without the influence of contiguous epithelial structures. It is true that in the healing of wounds the formation of epithelium seems to take place usually from the edges of the granulated surface; and it is therefore held by Billroth that epithelium is only produced in contact with epithelial tissues. But in all matters pertaining to pathological histology, Rindfleisch's views are entitled to the highest consideration; and he states that "it has been repeatedly observed that small spots of epithelium appear at some distance from the edges, which grow and finally coalesce with the marginal formations;" and in another place he states that the outermost layer of the granulation tissue constitutes itself epithelium. We would suggest, however, that the evidence adduced in reference to the epithelial spots which make their appearance upon the granulation tissue at a distance from the margin of the granulated surface is not sufficient to settle this controverted point, especially since it is now well known that epithelial scales, apparently dry, scattered upon a granulating surface, take root and grow, thus forming islets, as it were, of epithelial formation; and it would be easy to account for the appearance of the spots noticed by Rindfleisch upon the supposition that epithelial scales had been sown in those locations by accident — an occurrence which must often happen,— and that they had taken

root and manifested themselves, through their proliferation, in the production of the spots referred to above.

Before closing this report, we would state that there is a fair prospect of important results consequent indirectly upon the observation of Lostorfer upon syphilitic blood.

Whilst making examinations of the blood of different individuals, in order to test the truth of Lostorfer's doctrine, Stricker observed certain appearances which induced him to continue his researches in that direction, and he has already published several articles under the head of "Pathology of the Blood," which promise to be of great interest when supplemented by others which, we understand, are yet to follow. We regret that we are not able to give in this report a summary of what he has already written upon this subject.

Although but comparatively few points have been touched upon in this summary view of our knowledge relating to the study of pathology, still we hope it will suffice to bring before the Association interesting questions for discussion, and perhaps give direction to further investigation and thought.

DISCUSSIONS.

Dr. ATKINSON: I desire to congratulate this body on having among them a man who is capable of presenting such a paper as that to which we have just listened.

We have been dealing with *Function*, which means the action of organ or body. Function brings us to Protoplasm, in which leucocytes and every other functioning body has its birth.

Right here, I must dogmatize a little, in stating basal facts. Protoplasm is proteinaceous substance. I will try to nominate the process in serial order, and some misapprehensions of observers, writers and speakers on this point. We say we have first *cells*, which live in protoplasm; out of these are constructed *filaments;* these, bound together, form *fascicles;* these constitute *organs*, and these in their turn are corelated into *systems* — all of which are but channels of, or factors of, *function*, in their order and

degree. All these, in working harmoniously together, lay the foundation of *Physiology*, irregular expressions of which we call *Pathology*, or *Disease*. To understand this, it will be well to bear in mind Function in general, and Function in particular. And that we may get at particular functions, permit me to begin at the small end of Function, and nominate the serial order to the end of the changes so named.

I. ATOMS *unite*, in definite measure, under the influx of the endowment of POWER to unite. Atoms so combined form II. MOLECULES. Molecules, in aggregations, produce III. GRANULES. And these, when regularly arranged, produce IV. CELLS. Orderly arrangements of cells produce V. TISSUES. Due adjustments of these tissues produce VI. ORGANS. And co-ordinations of organs constitute VII. SYSTEMS.

Thus it is plain that *pathological* actions involve atomic, molecular, granular, cellular, organic and systemic deflections, which must be taken into the account if we wish to comprehend either physiological or pathological manifestation.

Irrigation and desiccation lie at the basis of all nutrition; I mean the use of water — H_2O.

According to the laws of Type, protoplasm is endowed with certain potentialities which may be helped or hindred, arrested or killed, during the efforts to fill out and complete the production of the factors of function, in accordance with the supplying or withholding of enabling circumstances and conditions. If we recognize red and white blood corpuscles as agents in function, and that function (feeding) occurs only in protoplasm, we shall be enabled to grasp the fundamental truth of nutrient function.

The difficulty of the whole question depends upon lack of clearness of perception of the objects under observation, and ambiguity of nominating bodies and processes observed and discussed.

Mulberry-mass has been treated of as a product of an ended process, when it is but an evanescent stage of metamorphic process, that may be physiological or pathological in indication, according to the circumstances in which it is found. Surplus of water (H_2O) lies at the base of all dilution, and excess or deficiency of water is the initial of all pathological change.

If you place the blood corpuscles so that water will pass over them, you may see the globular corpuscles become enlarged and

granulated. They appear to have nuclei, and at the periphery you see a ring, then another and another, until it has expanded beyond the size it was, thus disproving wall or pellicle; and when it bursts, and discharges the nuclei, it resembles vegetable dehiscent scattering of spores.

Take them before bursting, and desiccate them, and you reverse the process, and the granules gradually disappear, until the corpuscle regains its normal dimensions and appearances. If we now drop it into living flesh-protoplasm, it is ready, with the protoplasm, to become an element of the destined tissue of the part.

A red corpuscle is a compressed sphere, and looks to the novice as if it had a well-defined nucleus; but you may prove its transparency by shifting the stage or the light, and watching it during the change, which shows the supposed nucleus to be but the effect of diffraction of the pencil of light.

In the corpuscular and fluid portions of the blood-stream, we have the foundation of physiology and all its modifications.

The young corpuscle makes its advent into the "life current," and ripens into a fit subject for migration. It leaves the vascular domain in the disputed territory between arteries and veins, and escapes the capillaries into the sea of pabulum in the extravascular domain of cell-territory. If it find kindly reception, it at once takes up its abode in the new neighborhood, and is soon made into tissue by taking the place of its immediate predecessor, who in turn pushes his next in file further toward the peripheral end of the fiber of tissue, and so on in order; so that the oldest in the fiber may be shed as epithelial corpuscle, to serve the destined purpose of moulting.

Atoms have intelligence, and are the Master's first workmen. Molecules also have intelligence, but of a more complicated nature, and are workmen of next degree. The POWER, or endowment, by which atoms unite in forming molecules, is expressed in a series of measures called *bonds*. The satisfaction of these bonds of desire to unite, gives us the nature and character of the molecules formed by saturation or satisfaction of these bonds resident in atoms, and ready to be "whipped" into activity by the lash of "*spirit-power*."

This "genesis of molecules" is the result of satisfying atomic monads, diads, triads, tetrads, quintads, etc. etc., to the end of the chapter of the endowment of POWER to unite and to separate, and

reunite on a new and higher or lower basis of bonds. But time and your patience and attention would fail were I to pursue the witching beckonings into the depths of the laws and processes of organology.

The brother who read the paper mistook a condition for a cause of disease. It can, at most, be but the occasion of the deflected nutrition, which he calls "parasitic disease."

He also invokes the "*inflammatory*" process as caused by the presence of the "parasite." There is not time to upset and recast the doctrines of this interesting form of *perverted function*, which is called "inflammation," or I should be glad and most happy to enter fully into it, for the benefit of those who read books more than watch processes "*in actio*," which is the only method by which we can *know* whereof we affirm. My objection is to the wholesale methods of statement in mass which make up this paper, and other labors of the so-called scientists which now unfortunately are recognized as having been erected into the *science* of etiology, physiology, etc. etc., to the exclusion of real knowledge of these departments; which knowledge is only obtainable by the acquisition of the minutia of body and process, a feeble attempt at naming which I have just made.

Dr. JUDD: Dr. Atkinson seemed to take pains in correcting my pronunciation of the word leucocytes. He favors the pronunciation leucocytēs. The word is Greek — *Leukos*, white, and *Kutos*, a cell. The Greek plural is *Kutoi*. Anglicized, we have the singular Leucocyte, plural Leucocytes. I was very much pleased with the remarks of the gentleman, but I apprehend that what he said pertained to dead corpuscles. The changes in dead matter are what he described. He is accustomed to apply the term vitality to many phenomena which are not generally considered vital, as the crystal for instance. In regard to the dried or desiccated corpuscles, I do not deem the evidence sufficient to prove that it can be woven into tissue.

REPORT

ON

PATHOLOGY AND SURGERY.

By HENRY S. CHASE, of the Committee.

ALVEOLAR PERIOSTITIS — LOSS AND RESTORATION OF THE ALVEOLAR PROCESSES.

As this disease is so well known I will not describe its theoretical history, but instead, will give the

HISTORY OF A CASE

which I have recently treated.

Miss E, age 19; short; stout body, fat, florid and somewhat coarse complexion, black hair, and black eyes; comes for treatment.

About three years ago she was sick nearly a year with miasmatic intermittent fever. Took various kinds of medicines. Does not know whether she used mercury or not. About the termination of her sickness she noticed that her gums were somewhat swollen; they bled easily, but were not tender to the touch; neither did they give her pain at any time. Soon, her teeth began to loosen, and at the same time she observed a slight slimy discharge from the edge of the gums, and in the morning she found her teeth bathed in this discharge, and moreover had a very bad taste in her mouth; and her friends complained of the offensive odor arising therefrom. These symptoms continued to increase in severity from month to month, yet there was no depreciation of her general health, and although she had been frequently advised

to seek medical advice, she had delayed doing so, until driven to it by the frightful condition to which her mouth had at last arrived.

PRESENT APPEARANCE.

April 17th, 1873.—The gums are of a purplish red over all the teeth of both jaws. They are everywhere hypertrophied, but at their margins particularly, they are greatly thickened and form a *ridge* a quarter of an inch wide. The points between the teeth are still more swollen and of a deeper color. From their under surface flows a viscid, purulent fluid, bathing the teeth, and smelling offensively. The teeth are all present in the mouth, to the number of thirty-two, and undecayed, but everyone is loose in its socket, excepting the *third* molars, and can be moved in every direction. With a flat probe, a twelfth of an inch wide, I can pass up under the gum, toward the ends of the central incisors, five-eighths of an inch, and move it entirely around each root; and I find the alveolar processes entirely removed in front of the roots of all the incisors and canines of both jaws in the same proportion. On the palatal and lingual surfaces the loss is less by an eighth of an inch. The bicuspids and molars are affected about two-thirds of this extent, excepting the palatine roots of the first and second upper molars, which are denuded of bone nearly to their ends. The third molars are quite intact. These molars have only within a few months appeared through the gums. With the exception of the latter teeth, the probe passes around the roots of all. The gums themselves are nowhere absorbed, but occupy the same territory that they did in health, with the exception of a spot on the buccal surface of the upper right molar; but they are nowhere attached to the necks of the teeth.

HABITS OF LIFE.

She partakes freely of meats of all kinds; of coffee, pepper, spices, pickles, mustard and salt she is very fond, and indulges her appetite freely.

TREATMENT.

The diet is to be changed. All stimulants forbidden. Plain lean meat in moderation, vegetables, unbolted wheat bread and milk allowed.

The teeth are to be cleaned three times a day with soap and water. For the present I prescribe no internal medicines, wishing to see what Nature herself can do, with a fair opportunity. I determine, however, to institute

LOCAL TREATMENT.

The remedy which I have best succeeded with on former occasions, and which I have constantly used since 1864, is chloride of zinc paste, made as follows, viz.:

Chloride of zinc	60 grains.
Blood root	15 "

Grind the crystals with the powder, without water, until moisture enough from the atmosphere has been absorbed to make a thick paste. This paste is sticky and is easily carried to and left at any desired location, where it will remain unless removed by water or saliva.

My plan is to cauterize all parts undergoing inflammation, and therefore I shall carry up under the gums the cautery, and reach as nearly the ends of the roots of the teeth as my instrument will allow. I have a very thin steel instrument with a flat blade, about one-twelfth of an inch wide, rounded on the end, but having a sharp edge turned towards the handle. A similar instrument is sold at the dental depots, for removing tartar from beneath the gums. As some distinguished dentists have recommended nitrate of silver, in this disease, I conclude to try its virtues on the left side of the mouth, while on the right side I use zinc chloride. The silver nitrate is to be melted on the end of a thin silver probe. Taking the zinc on the instrument described, I pass it under the gums as far as it will go, moving it around, and up and down the surface of the root of the tooth. I find that a granular substance covers the surfaces of all the roots, feeling as I remove it like soft tartar. I am particular to thoroughly remove this. I have before met with this condition in this disease. The instrument with which this is removed is kept covered with the zinc, so that cauterization can be done at the same time. Much blood flows from under the gums and carries away some of the paste, but enough is left for my purpose.

Before applying the silver nitrate to the left side of the mouth I remove all the granular substance from the roots. The probe

with the nitrate is then passed up and around the roots in as thorough a manner as was the zinc on the other side. The patient exhibits and complains of much pain during the whole operation, which required about two hours for its performance.

April 23d. — Patient came again, it being five days since last visit. No improvement manifest. Granular deposit covering the roots of all the teeth again, but not as much in thickness.

The same treatment as at last visit continued. I find that blood flows more copiously than at the former visit, and that the patient complains of more pain when using the cautery; this is, I think, an indication that granulations are springing up.

April 26th. — The gums look less congested. There seems to be less purulent discharge, and the patient says she has not as bad a taste in her mouth in the morning. She says the right side feels best. I can see that it looks better than the left side.

I use the zinc chloride on the right side, and find that the probe will not extend toward the end of the roots as far as it did at the first visit; there is a semi-soft-solid substance preventing it. This is an indication of new-formed living matter. The granular substance is found covering all the roots again, though still less in quantity than before. Blood flows freely still from the cauterized parts, but of a more healthy color than previously. On the *left* side of the mouth I find a larger granular deposit, and a smaller one of new-formed material, than on the *right* side.

I drop the silver nitrate hereafter, and use the zinc chloride exclusively.

May 1st. — Patient improving. Countenance less florid, with a smoother skin; the gums improved in color, and less thick, especially at the edge, where, however, there is still a ridge. The lobular masses between the necks of the teeth are reduced in size. No purulent discharge to be seen, only a slight glairy fluid is seen on close examination.

This is probably an overflow of new colloid from the blood plasma. On closer examination there is seen a little purulent fluid coming from under the gum between the left under canine and incisor. The granular deposit grows less. The formed material increases, for the probe will not pass up under the gums as far as at the last visit. The resistance to the instrument is about the same as that of a hard-boiled egg with the shell removed. The

teeth are growing firmer. Zinc chloride treatment continued. Wash the teeth daily with tincture of tannin.

May 7th. — Case continues to improve; no granular substance on any of the roots. Gums less puffed and of healthier color. No discharge excepting between left under canine and incisor. The probe does not pass under the gum and around the roots more than a quarter of an inch, and then meets the semi-soft-solid before mentioned.

May 17th. — Continued improvement. Continue same treatment.

June 5th. — Great improvement. Probe passes not more than an eighth of an inch under the gums, without meeting the same resistance of new-formed tissue. The teeth are increasing in firmness, and are almost naturally so, excepting the under central incisor. The gums are healthy in color, excepting the very edge and the festoons.

Heretofore I have avoided lancing the gums, as I did not wish their edges to contract down upon the necks of the teeth, until the distal portions under the gums had become healthy, and the new alveolar tissue formed, as it would interfere with the application of the cautery. I wish this result now to follow, and so lance the gums with a sharp thumb lancet, slitting open every "festoon" in the mouth. Zinc chloride treatment continued.

June 19th. — All the gums look healthy, even to the edges and festoons, excepting a little spot near left under canine and left upper incisor. Here there is a slight glairy discharge. The teeth are all firm. The probe will not pass under the margin of the gum further than in health. In fact it could not be gotten under the edges of most of them without considerable force.

July 21st. — It is five weeks since I have seen the patient; I had not dismissed her, but she thought she was well, and so had remained absent. In the mean time she had returned to her former diet. She now complains that her mouth has an unpleasant taste in the morning. I find a slight discharge from the left under canine and left upper incisor, the same teeth that have all the time lagged in their cure. Still the mouth looks well, and no one would think it diseased even on examination. The teeth continue firm in their sockets; firmer than at her last visit. I take a sharp-pointed instrument and pierce the gum between the roots, and

find that calcification of the new-formed alveolar process has taken place.

A microscopic examination of the granular substance, found on the roots, was made at the third visit, and found to correspond in shape to crystals of sodic chloride.* This salt is abundantly found in protoplasm or living albumen.

August 1st.—The patient presented herself, smiling, and she was better pleased with the condition of her mouth than at any time before. The two teeth that she complained of at the last visit are now well. Being a little fullness of the festoons at those two points, I slit them open with the thumb lancet.

As I think this case of disease has been caused by the constitutional effects of mercury, I am afraid that it may still be having its influence on her system, and, therefore, I shall prescribe medicines with the view of destroying the influence of the poison. She is to take daily, until her next visit, which will be in fourteen days, five grains of iodide of potassium.

The picture which I have endeavored to present of this disease, as manifested in the history of the *case*, is very imperfect. I could only give the totality of its symptoms as I first saw it, and its subsequent differentiation towards health, after therapeutical and hygienic treatment had been instituted. The hidden chemico-vital changes that took place from the commencement or birth of the disease until its final departure, every physiologist and histologist must imagine for himself.

But the physiologist can draw no line of demarkation between health and disease; between physiology and pathology; for only as he observes marked differences between them can he say that *this* belongs to the domain of disease, and *this* to health.

As health is not an entity, so neither is disease; both are merely relative conditions; one a harmonious operation of the various functions of the body, and the other the reverse.

In other phases of biological truth, the same holds good; for who can draw the line between the animal and vegetable kingdoms; or who can point to the exact line between the living and the non-living?

Microscopic research shows that living beings are evolved out of the not living, or inorganic substances, independently of the

* See Lehmann's Physiological Chemistry, Vol. II., Plate 6, Fig. 39.

influence of the living. It is also known that the same newly evolved living matter may grow both into animal and vegetable forms. There is, therefore, no boundary line here; these different states or conditions differ only in degree. In somatic death the functions of the body, as a whole, are destroyed; still there yet remains molecular life for a time; then there occurs molecular death or destruction of the functions of the tissues; still there is inorganic life, if I may be allowed the expression, and it shows itself in chemical processes which take place there, and these same chemical atoms may originate or evolve microscopical life even before there is apparent dissolution of the body; thus is life an unceasing round of chemical actions, expressing itself in various forms from the highest to the lowest, depending on its surrounding incident forces.

Can small-pox, syphilis, scarlet fever, and measles only be propagated, or arise from contagion? The first case of either of these diseases must have arisen *de novo*, at some time far back in the history of the world, or else was evolved out of some other, and may be a less virulent form of disease, which perhaps was *not* contagious.

The diseased living matter which has the power to be transferred from one living organism to another, and there grow and multiply by the plasma of the blood which it feeds upon, is not to be distinguished in form or chemical composition from healthy matter. It differs from the latter only in its power to do mischief. May this power not be owing to the peculiar arrangement of the ultimate organic molecules of the diseased matter?

There are many *inorganic* compounds having the same chemical composition, precisely, that yet have entirely different forms and powers. This difference in properties is supposed to depend on the peculiar arrangement, or juxtaposition of their ultimate atoms. We have reason to believe that the analogy holds good in regard to the powers of living healthy and living diseased matter.

Under favorable conditions, which are under the control of man, *living* matter is evolved out of the non-living, *de novo*, and without the influence of *pre*-existing living matter; then why should not living diseased matter arise, *de novo*, under favorable conditions, without the influence of pre-existing diseased matter?

In the case of periostitis described there was a loss of bone

substance. Was this wasting away a chemical process not under the domain of vital action? Certainly not. It was the result of chemical action under the influence of living tissues, in which the elements of the alveolar processes were taken down and carried off in the blood; but concomitant with this absorption was a purulent flow, having external exit, composed partly, perhaps, of the broken down osteal tissues, but mostly of recently living matter—albumen just poured out of the capillaries, capable of being converted into healthy formed tissues, but unable to do so owing to the unfavorable chemico-vital conditions of the diseased territory, which was undergoing analytic instead of synthetic change.

One remarkable feature in the history of this case is the fact that there was no recession of the gums. They were hypertrophied, but otherwise maintained the same topographical relation to the teeth that they did in health; but undoubtedly if the disease had maintained its course uninterruptedly for a longer time than it did, there would have been an absorption of the soft parts equal to that of the hard tissue. The readiness with which the diseased condition responded to the action of the zinc chloride is, I think, due to the fact of the integrity of the gingival tissue.

The new formed tissues were thus protected from exterior disturbance, and chemico-vital charges could take place here with almost the certainty that they could in the glass retort of the laboratory.

The interesting phenomena of the incrustation of the roots, repeated every few days, until the reparative process was set up, is easily explained; being only a deposition from the albuminous discharge, which was *super*-saturated with sodic chloride, the latter salt being abundantly found in all protoplasms ready to undergo synthetic transformations. Moreover, this patient was a great consumer of this salt as a condiment with her food. No thinking person, I am sure, would confound this incrustation on the root with ordinary *tartar;* but it is analagous, though not the same in chemical composition, to the incrustation found on the ends of those which have been extracted where this disease has been local; only one or two teeth having become sore and loose.

The chemical process by which a pathological condition of the skin is produced by a red-hot iron may be explained, but the chemico-vital charges which take place in the formed tissues when

invaded by the poison of mercury, causing a disturbance in the forces which were then in equilibrium, are yet unknown, but I hope not unknowable.

The future looks bright with the promise that vital chemical charges will be as well recognized, in health and disease, as those which take place in the laboratory of the chemist.

Then will arise a truly scientific system of medicine; for the physician will then be able to select and apply a remedy for each disease, with as much preciseness as the chemist can now select elements to form definite compounds, and again to separate the most complex compounds into their elementary individualities again.

But with this hope, we have the promise too of a host of new diseases, arising *de novo;* or an evolution of pre-existing forms of disease into more malignant types, resulting from the thousand nameless conditions growing out of new forms of social life, density of population, etc.

But the unknown is eternal, and will continually arise in new forms to beckon on the mind of man to the attainment of knowledge; and when cycles of ages upon ages have past, we never need fear the time will come when the soul can sit down in apathy and say *I am satisfied.*

DISCUSSIONS.

Dr. JUDD remarked that he had made some examinations in regard to some of the points touched on in the paper, and had come to the conclusion that wherever there was any discharge, there was chronic inflammation. In one case, where there was no discharge, by passing a broach in he obtained pus corpuscles. He had used both nitrate of silver and chloride of zinc, but regarded it as almost demonstrated that chloride of zinc was the best. In relation to the fine deposit, he stated that some microscopical observers show the form of the crystals to be carbonate of lime. He thought this was so; whether or not similar to the common deposit, he did not know. In relation to the doctrinal points of

the paper, he said there was nothing of greater interest than the theory of spontaneous generation, or the evolution of the living from the non-living. A century ago it was the general belief that animal forms arose out of dead matter. The maggot was supposed to come from the flesh. Redi was the first man to explode this view. His experiments were rude, but sufficient to demonstrate that the maggot did not come from putrefying flesh. It was only necessary to place a net over the flesh, and the maggots did not appear. The contest between both sides of this question has been carried on in every way, until those that believe in spontaneous generation have been driven to the last extremity. In the last few years, the experiments of Bastian have been brought forward to controvert those of Pasteur; but they have not succeeded in so doing. Dr. Judd stated, further, that he did not believe in this doctrine of abiogenesis; that it was not generally held by scientists, and that it must give way to one more rational and one more in accordance with what we know of the laws of nature.

Dr. ATKINSON said that a great deal of confusion arose from false nominations, false interpretations and want of knowledge. "Dead matter" is living nonsense! If we knew the methods of organology we would not boggle in this way. The learned gentleman who read the paper, used the terms atoms and molecules in the same sense. Molecules only arise out of atoms. If he had said that molecules depended on atoms he would not have been so ambiguous. In regard to what my brother Judd said, I clear myself from mere dogmatism when I say that I did not mean desiccation in its full sense of dryness. I gave it as an opinion that the corpuscle, when reduced to its original size, after it had undergone dilution and granulation, might, when put into fresh living pabulum in the cell territories, be spun into living tissue. However, this is not now of pressing importance to us.

The work of most immediate importance is that of canceling our novitiate (in which we have been memorizing formulæ) into the ability to comprehend the processes of nature with which we are constantly dealing. This will lift us up above the habit of blindly following the statements of men's apprehensions of these processes, observed long ago and under weights of misconception of body and process in every field of natural philosophy.

The so-called categories of "*science*" everywhere are made up

of, mainly, repetitions of this effete verbiage, without once comprehending the true significance of the words we utter!

Again, I deny what was said in the paper last read in regard to mercury. Mercury is inert, as mercury.

In regard to the chloride of sodium crystals said to be present, they cannot be recognized by the microscope where there is a watery current flowing to dissolve them. The microscope said (to his apprehension) that there were crystals of carbonate of lime. There may have been a little chloride of sodium entangled in his specimen; I would not trust myself to say there was not, until I had submitted it to the test.

Another point. I perceive that there is an evident want of understanding in respect to the difference between *Force* and POWER.

POWER is generic — *Force* is specific. POWER is infinite — Force is a department of power.

Atoms are incapable of being killed. Professor Flagg, a very learned man, claimed to have killed atoms; but we know how that was — he meant molecules when he said atoms.

Wherever POWER is, all modes of force are involved. Now, these molecules get hungry, and they know exactly when they have enough. These are subjects that demand our highest efforts to comprehend, and men ought to be more humble and earnest in their study. There are very many relations under which atoms and molecules stand to each other, and an inverted order of these relations constitutes that part of the field of functions which we differentiate as the department of *Pathology*.

Dr. CHASE: If Dr. Atkinson had paid better attention to what I said he would have known that "the learned gentleman" did not "boggle," but I think brother Atkinson does, in putting words in my mouth which were not my own.

Dr. ABBOTT: I was very much interested in the paper — not that the case was particularly rare, for we frequently have just such cases to treat. As I understand the paper, it was a case of detachment of the gums, absorption of the alveolar process, and death of the periosteum, occasioned by a calculary deposit upon the teeth. The writer carefully avoided, however, to state whether, in his opinion, the periosteum in this case was dead, or intact. In my

opinion, it certainly was dead, and not a trace of it could be found upon the teeth where a detachment had been effected.

As regards its restoration, from my observations, it is *never* accomplished in these cases. And from the observations of the best surgeons in this country, it is *never reproduced* in *any* locality. But what is produced (in operations where, to a casual observer, it would seem a reproduction of the periosteum,) is connective tissue, and not endowed with the functions of the original membrane.

The looseness of the teeth is caused by hypertrophy of the remaining portion of the periosteum, and kept in this condition by the inflammation constantly kept up by the presence of the calculary deposit. Generally, in diseases, if the cause can be removed the cure is simple enough. Is it necessary, then, if the cause (tartar) be removed, to use any material which shall increase the inflammation; or shall we let Nature do the work, we contenting ourselves by simply keeping the parts clean and disinfected? The irritating element having been removed, the inflammation subsides, the periosteum assumes its normal thickness, and the teeth become firm again. Through the remaining portion of the periosteum, the alveolus is undoubtedly partially restored again.

The disinfecting dressing that I use is,

℞.—Carbolic Acid, ʒ i;
Glycerine, ℥ i;
Aqua, ℥ vij.
To be used with a syringe once a day.

Dr. WALKER said that after removing the tartar, he used a solution of equal parts chloride of zinc and water, and then, on alternate days, a preparation as follows:

℞.—Carbolic Acid, ⅓ ʒ;
Iodine, ⅓ ℥;
Glycerine, ʒ ℥.

Dr. OSMOND gave the following preparation:

℞.—Potassii chlorate, ʒ ij;
Tinct. Arnica,
Tinct. myrrh, āā ʒ iv;
Aqua rosæ, ℥ vj.
Apply five or six times a day.

Dr. MORGAN said that every disease should be treated on its own merits. General principles furnished the only philosophical

guide to practice. Whenever we deviate from this to prescription practice we become an arrant set of empirics. Sometimes we want stimulation, and again a reduction of the vital force. A gentleman said that periosteum is never reproduced. I think it is very frequently reproduced. I don't know that it ever is on the root of the tooth, but I know it is elsewhere.

Dr. CHASE: I have often found an aching tooth undecayed, and when the pulp cavity was opened, a greater or less portion of the pulp calcified. In these cases I apply arsenic and treat for death of the pulp.

Dr. HERRIOTT thought the periosteum could be reproduced. If not, he could not see why teeth get so solid as they do. In many cases he thought heroic treatment was resorted to when it was not necessary. Homœopathy had done a great deal of good by reducing the doses of those in the regular practice, though he was no *little-pill* doctor himself. Where the nerve was left all right, he thought the periosteum could be reproduced.

Dr. OSMOND suggested that if the pulp were not already dead, such treatment as that proposed would kill it.

Dr. JUDD: I arise to correct a misapprehension. We are not discussing a common case of impaction of tartar. There is no impaction of tartar. It requires a microscope to distinguish the crystals. This case is entirely different — very much more rare. We are all very well aware that in a common case of impaction of tartar the removal of the tartar is all that is necessary. But I want to call attention to one fact; there are certain diseased conditions in which the cause has passed away before it has come under our observation. They have become chronic, as when inflammation exists, and continues to exist after the cause has passed away. We see this in the diseases of the throat, nasal passages, and other mucous membranes. We need something to stimulate the vessels to resume their normal caliber.

Dr. BUCKINGHAM said that the remedial action of chloride of zinc and carbolic acid was the destruction of the parasites, thus getting rid of foreign matter.

Dr. STELLWAGEN said that Dr. Chase did not go into the action of these agents, because he presumed every gentleman knew that the object was to constringe the surrounding parts and get rid of the parasites.

Some sporadic discussion then arose as to the use of the words periosteum, pericementum, and peridonteum. Dr. Stellwagen remarked that after inflammation had set in, he would defy any one to show any line of demarkation between the pericementum and the periosteum. Dr. J. S. Smith called attention to Wedl's distinction in terms — he called that which covered the root, the *root membrane*. The discussion was closed upon that topic by a remark of Dr. Judd, that cementum was true osteal structure.

Dr. CHASE: I deny that Pasteur, or any one else, has demonstrated that 300° of heat does not destroy germs. Because living things developed in Pasteur's flasks after heating them to 300°, that scientist assumed that the germs of these living beings had resisted that degree of heat. He saw no germs, and with the most powerful microscope no germs could be found in the infusions in which living beings were evolved in Bastian's experiments. This gentleman was successful in over fifty experiments; and Wyman, Sanderson, and others, have corroborated the truth of his results by their own experiments.

REPORT OF THE COMMITTEE

ON

DENTAL THERAPEUTICS.

By H. L. SAGE, Chairman.

THE past year has not been so prolific in discoveries in the way of *new* dental remedies, and their employment, as might be wished by the friends of progress; but it is, nevertheless, a source of gratification, that signs of advancement "all along the line" are quite perceptible — at least, the interest among the *enrolled* has not seemingly been abated.

One short year is a mere point of time in the ocean of progress, and it is only by a patient and hopeful spirit, allied with unceasing vigilance and effort, that any results worthy of the name can be chronicled.

As the results of "original investigations" may be somewhat meager, it would naturally be expected that there would be more material for a report, culled from the aggregate *revealed* experiences and discoveries of the dental profession in this and other countries. And yet the supply from the latter source is not unlimited, of that which is *new*. While the interest of a report must depend greatly on the facilities possessed by the Committee, for collecting from dental and medical literature, and other sources, any matter which may be of real, intrinsic worth — the results of personal knowledge and experience of, and in, the therapeutic value, manner of employment, and scope and direction of activity and usefulness of medicinal agents, are still more difficult of attainment.

Hence it is that not a little anxiety and responsibility must attach to those upon whom devolves the duty of presenting reports

before this body, and in some cases, also, some measure of diffidence, and a shrinking from the task.

Though, as before stated, since the last meeting of the Association, very few *new* remedies have come to light, the field of usefulness of others, with which we are somewhat familiar, has been enlarged.

The subject of constitutional treatment, and through it the effects upon the development, structure and composition of the teeth, and the prevention of dental caries, is yearly receiving increased attention, thereby bringing into view with greater distinctness, the proofs upon which rests the theory of the chemico-vital action of caries.

The remedy which has recently attracted the most attention, and excited the greatest interest, and elucidation of its merits in this direction, is the Syrup of the Lacto-Phosphate of Lime — the formula for which has been published in some of the dental journals. It is said that to the French physicians is due the honor of having first exhibited the lime in this form.

The greatest advantage claimed for this preparation over the simple pulverulent phosphate of lime is, that it is more easily appropriated by the system, *i. e.*, more readily and largely assimilated or absorbed by the blood and tissues; the phosphate, instead of passing off as waste material, being utilized to a much greater extent than formerly; for the reason that, being fitted for reception in the stomach by previous digestion or dissolution in lactic acid, the functions of the digestive fluids are rendered less onerous by the assistance afforded them.

To condense and simplify the statement — the natural acidity of the gastric juice is due to the presence of lactic or hydrochloric acid — whether the former, the latter, or both, is a matter of some dispute.

But it has been shown that, "if the gastric juice is sufficiently concentrated, it will dissolve phosphate of lime, and that *both* these acids seem capable of imparting solvent properties to the digestive fluids, and that one may be substituted for the other." (Piggott's *Dental Chemistry*, pages 121 and 123.) Dalton says (*Physiology*, p. 139) that "Bidder and Schmidt found in most of their analyses hydrochloric acid in place of the lactic; that Lehman regards the latter as much the most abundant of the two; that Robin and Verdeil

also regard the acid reaction of the gastric juice as due to the lactic acid; that Bernard has shown, by a series of well contrived experiments, that the free acid of the dog's gastric juice is undoubtedly the lactic; and that the hydrochloric acid, obtained by distillation, is a product of the decomposition of the chlorides which enter into the composition of the fresh juice." But though lactic acid is a solvent of the phosphate of lime, the gastric fluids do not contain it in sufficient quantity to effect the solution of an adequate amount. Hence the waste, and hence very slow effects are produced, when it is administered in the usual manner, because it enters the circulation in such minute quantities. Hence, also, the lacto-phosphate of lime greatly facilitates digestion, and as effect follows cause, the appetite is increased and nutrition stimulated, while it is tolerated by the most delicate stomach; so that its exhibition would seem to be specially indicated for females during the period of gestation and lactation, when that organ is so likely to be sensitive *to*, and intolerant *of*, ordinary remedies, and when the teeth are so prone to deteriorate by the abstraction of the lime salts, and the general diversion therefrom of the nutritive elements.

It has long been maintained that the constitutional employment of the phosphate of lime, has not only been of benefit in scrofula and phthisis, but more especially in rachitis, and when the teeth are deficient in the mineral constituents, though in the latter direction, so far as we are aware, there are no reliable data of the results of its exhibition.

It would seem that young and soft teeth especially would respond to a thorough and systematic course of constitutional treatment, and that hardly a more interesting field for study and experiment could be entered upon. At least, it is a subject which merits the earnest attention of the profession.

There are two classes of theorists — one of whom maintains that the structure of the teeth can only, or at least *best*, be improved in character by supplying, in the *food*, those constituents in which they may be deficient, which is usually and eminently the mineral; and to this end there should be a proper selection and preparation *of* and an admixture, *in* the food, of earthy and animal matters; the introduction into the system of the former, with the ordinary, everyday pabulum, being more in harmony with the organic functions, and therefore more easy of appropriation by the bones and teeth,

than if taken in the form of the simple powdered phosphate, or in combination with acids, or other vehicles. Great stress is therefore laid upon the importance of the persistent use, with other kinds of food, of the *farinaceous;* from which the lime, constituting the hull or outer portion of the kernel, has not been abstracted by bolting.

The other class, though, for the most part, admitting the influence of diet in this direction, maintains that the same or even more rapid results are attainable by the medicinal exhibition of the phosphate; more particularly since the introduction of the lime in solution with lactic acid.

Both methods of treatment are doubtless beneficial, though it may be urged, in favor of one over the other, that it is more difficult to influence *our* patients in the matter of diet than to persuade them to make use of a pleasant syrup like the lacto-phosphate of lime. This, as usually prepared, contains between two and three grains of the phosphate to the teaspoonful or fluidrachm. Wyeth & Brother's preparation contains two grains to the fluidrachm.

Dose — three times a day after eating; for children, a teaspoonful; adults, a dessertspoonful; for infants, in proportion.

Previous to the employment, in this country, of the lime in solution with lactic acid, phosphoric acid was sometimes employed as a solvent. The *Dental Register* for 1871 gives the following formula, with an editorial indorsement.

The formula is here reproduced, without knowing which of the preparations the writer would now consider the best:

"℞ Acid Phosphoric, dil. U. S. P., q. s.

"Phosphate lime, fresh precipitated, q. s.

"Dissolve the phosphate of lime to saturation in the acid, filter, and add an equal quantity of pure glycerine, or of sugar — preferably the glycerine (in case of anæmic condition, phosphate of iron may with advantage be added; also made tonic by the addition of sulph. quinia)." This contains about 5½ grains to the fluidrachm.

Which is preferable, the lacto-phosphate, or the phospho-phosphate, when administered for the definite purpose of improving the character of the teeth, must be left for decision to those best capable of judging. But it would seem that the former, as being less foreign, and the most grateful to the stomach, would be the most efficient, since the most perfect digestion must be had, when this

essential point is reached — the lactic acid, of itself, having been, it is said, employed with good results in certain forms of dyspepsia.

There is another direction in which it has been suggested that the exhibition of the lacto-phosphate might prove beneficial.

It is in cases of retarded dentition, when the same is consequent upon a deficiency of the lime salts in the blood — if such retardation is ever dependent upon such a state, as it thus appears, aside from any mechanical obstruction from crowded permanent, or persistent temporary teeth.

There is quite a difference between the checked eruption of a tooth from a cessation of development, and its non-appearance from other causes, after its full development is accomplished; for, in the latter case, it is not so certain, theoretically speaking, that the administration of the lime would cause the lagging tooth to appear. We can conceive how this might be beneficial if, from any change in the system, the supply of mineral constituents were cut short, and the further growth of the tooth (root) suspended, and withal its eruption; for according to Tomes (*Dental Surgery*, p. 293), a tooth, in normal process of eruption, is pushed forward and emerges from the gums long before the root has attained full length, the latter process progressively effecting the movement toward the surface, the absorption of the overlying alveolus induced by the pressure permitting its emergence, which, if delayed until after the completion of root development, must be accomplished, if at all, as he supposes, by the contraction of the lower portion of the socket, which latter process also forces the tooth surfaceward, thus causing its final appearance, the pressure of the crown inducing, as in the former case, the absorption of the obstructing tissues — the contraction of the socket being consequent on a deposition of bone at the part undergoing change.

Thus, there must be, if this theory is true, in all cases in which teeth are erupted late in life, an increased supply of ossific matter at the sites of the roots of the decayed teeth, thus giving a new and extraordinary impetus to the sluggish forces.

But is not this, if of the nature set forth by Tomes, a pathological process, depending on an over-stimulation of the functions in this region, and inducing a determination thereto, in excess, of bone pabulum? If induced by *gentle* local friction from any cause, as in mastication, which is seemingly not impossible, the process would

be normal, or the reverse, were the friction severe enough to excite inflammation. In either case, there would be an increased supply of blood thitherward, and possibly ossific matter enough to produce a thickening of the alveolus.

In case of the loss of contiguous teeth, which might have, in a measure, afforded protection to the part, it would thus be exposed to more violent friction, from a more free contact of the food in mastication, thus stimulating and engaging the forces to greater activity in this direction.

It is barely possible that this deposition of bone on the sides and bottom of the socket, may be what Harris calls "exostosis of the alveoli," on which is sometimes dependent the elongation and loosening of teeth, simultaneously with, in most instances, and as age advances, the further and gradual solidification and calcification of the osseous system.

May not the conditions be similar when teeth are erupted at the ages of thirty-two, forty, and forty-five, as in cases cited by Mr. Tomes?

Except from this, or the cause before mentioned, how are we to account for the resumption of the work of dentition, admitting that development is completed?—for, according to Tomes, if a certain tooth failed, though present in the jaw, to make its appearance, and the corresponding tooth on the other side was normally erupted, the missing tooth would be found to be, equally with the other, fully developed.

If the completion of dentition, in such an instance, depends upon contraction and exostosis of the socket, might not the same conditions extend to the alveoli of the adjoining teeth, and thus cause mischief?

It is difficult to see how such a process could be confined to the region of the imprisoned tooth, *i. e.*, nutrition diverted to that point alone.

But may not the *development* of a tooth, simultaneously with its *cutting*, be so very *gradual* as that its tardy eruption may be due to *this* circumstance? If dentition is sometimes delayed a longer or a shorter period by retarded *development*, the administration of the phosphate of lime *might*, perhaps, be of service; but whether it *would*, or not, when full development has been attained, is a matter more difficult of solution.

There is likewise another direction in which the exhibition of the lacto-phosphate would seem to be indicated, and that is where, after the mechanical movement of teeth, in cases of irregularity, it is desirable to assist in the reproduction of the bone, lost by the enlargement and absorption of those portions of the alveolus, or socket, from which, and toward which, the root of the tooth has moved, or rather the filling up of the spaces, or sites, which were occupied by the root before the movement was accomplished.

If the time usually required for the moved teeth to become firm could be shortened, "it were a consummation devoutly to be wished," as the patience of the patient would not be so severely taxed, as is sometimes the case, to such an extent as to lead those of weak determinations to prematurely abandon the use of retaining appliances, with the unfortunate result of permitting the regulated teeth to partially or wholly regain the positions occupied previous to the correction of the irregularity.

It would seem that constitutional treatment might be efficacious under such circumstances, especially when the bones are illy nourished, or where the supply of bone phosphates does not keep pace with the depravity or deficiency, consequent upon a too rapid growth of the body, or in which nutrition may be directed to other portions of the system at the expense of the osseous, or where, after reaching maturity, all the constituents of growth are more sparingly supplied. The thought may be worthy of consideration, and experiment lead to valuable results.

Recently there seems to have been rapid progress attained in the treatment of partially dead and sloughing pulps—judging from the testimony of some reliable and prominent English and American dentists.

A new method of local treatment for such has been advocated and practiced to some extent, and a new remedy introduced for the purpose, by Mr. Oakley Coles, of the Odontological Society of Great Britain, the employment of which he has found satisfactory, after nearly a year's trial.

Advantage was taken of one of the constituents of the gastric juice, viz., its organic matter, called *pepsine*, the powdered pepsin being acidulated with dilute hydrochloric acid, to intensify its action, with the addition of glycerine, to render it pasty. Lactic acid may be, and sometimes is, substituted for the hydrochloric.

In *Piggott's Dental Chemistry*, we are told that "hydrochloric and lactic acid can alone constitute, with pepsin, an active digestive fluid;" and in *Dalton's Physiology*, that "the free acid is an extremely important ingredient of the gastric secretion, and is, in fact, essential to its physiological properties; for the gastric juice will not exert its solvent action upon the food, after it has been neutralized by the addition of an alkali or an alkaline carbonate."

The Missouri *Dental Journal*, February, 1873, gives the French process of manufacture of Boudault, and also that of Mr. Sheffer, of Louisville, Kentucky, with the relative strength of the different preparations in the market. The crude pepsin is obtained from the mucous membranes of the stomachs of sheep or hogs, which is further prepared for use by chemical process.

Wonderful solvent properties are attributed to this agent. When hydrochloric acid is combined with pepsin, it forms — according to Professor C. Schmidt — "soluble compounds with albumen, gluten, chondrin, etc." Acidulated pepsin readily dissolves coagulated albumen, while the aqueous solution does not.

Mr. Sheffer has dissolved three thousand parts coagulated albumen with one part pepsin. It is also stated that one part pepsin dissolves sixty thousand parts of milk.

Pepsin is, when freshly precipitated, very soluble in water; when dry, only sparingly soluble. The aqueous solution is very nearly neutral.

Pepsin is coagulated by boiling, thus neutralizing its solvent power. Alcohol precipitates it, and greatly impairs its digestive properties.

Pepsin is likewise injured if subjected to a temperature much above 100° F. Hence, hot drinks, when taken into the stomach, retard digestion, and are, from this cause, injurious.

Pepsin acts upon dead tissue only, and causes no pain.

Henry S. Chase, M. D., D. D. S., refers, in the Missouri *Dental Journal* for April, to his brief experience with this agent, as of a very satisfactory nature, with a recommendation to all to try it. His method of treatment, and that of Mr. Oakley Coles, do not essentially differ.

A *resumé* of the indications *for*, and the manner *of*, its employment may not be inappropriate.

What are the indications for its use?

First. When a pulp is partially dead and sloughing (or in such a highly inflamed or congested condition as to have lost all recuperative power), in order to remove the affected portion by dissolving it, the healthy being left intact.

Second. To remove by digestion (afterward syringing) portions of pulp, dead and inaccessible, or with great difficulty accessible, and incapable of being removed instrumentally.

Third. When a pulp has been partially destroyed by arsenic, to separate the devitalized from the living portion, preparatory to capping the latter.

Precisely in what manner should the pepsin be used?

First excavate the cavity partially, though about the borders pretty thoroughly, dry it perfectly, place the pepsin in contact with the exposed and partially dead pulp, and confine it in the cavity by sealing with wax, adapted to the walls with a hot instrument, (or, as some say, wax and cotton), leaving it undisturbed for two or three days, using no creasote or anything of the kind previous to making the application, and syringing with tepid water before and after. This being done, the remaining pulp tissue is touched with creasote or carvacrol, capped with oxychloride of zinc, and the cavity filled, temporarily at first, and permanently afterward, or permanently at once, according to the judgment of the operator.

This is the gist of what is *practically* known or inferred regarding dental pepsin, the main object being to save, by gently detaching the dead from the living — not neglecting, as a final requisite, after the careful nursing and recovery of the living portion, its permanent protection, by the insertion over all of an indestructible material.

In regard to the deleterious effects of certain medicines upon the teeth, it is so generally known as to have become a matter to which attention has ceased to be directed. Various medicinal preparations containing acids are about the only class which are supposed to have, by their exhibition, a local action on the teeth, and probably the only ones for which physicians and dentists have occasionally prescribed antidotes; while they are, in very many, if not the majority of cases, administered without the attention of the patient being directed to their injurious effects in this respect, and the manner of neutralizing them. It is not generally known

that one or more of the preparations containing potash, which are in extensive use as medicines, are very destructive to the integrity of the dental organs. If this is the case, the fact should be widely known, and antidotes sought and prescribed; and it is for this purpose, and that future observation and experiment may be brought to bear in this direction, that the subject is here referred to.

The bromide of potassium, which is largely employed as a sedative in the treatment of neuralgic affections, has, so it seems, after frequent and not very prolonged use, greatly impaired the structure of the teeth — at least the proof of this has seemed apparent from recent, though limited, observations in this direction.

For example: A lady with teeth in good condition, of good quality and finely polished, found it necessary to call a physician, who prescribed the bromide of potassium. After a daily and exclusive use of it for nearly a year, the lower bicuspids more especially, became so soft as to be very easily cut — almost as easily as chalk. Other cases have been noticed.

After a short personal experience with this remedy, the inferior teeth became very sensitive about the necks, and, though the sensitiveness disappeared in a measure, after ceasing to use it, the bicuspids are permanently injured on the cervical portions.

When and *how* does this agent act?

As is supposed, when the fluids of the mouth present an acid reaction, the bromide of potassium, by contact therewith, becomes a destructive agent, forming hydrobromic acid, which rapidly corrodes the enamel. Therefore, the medicine ought not to be administered in such cases without the after and immediate rinsing of the mouth with an alkaline solution — as that of the bicarbonate of soda.

The indications of rapid deterioration of the teeth, *seemingly* from the exhibition of this medicine, and that the attention of the profession may be enlisted in this direction, with a view of eliciting further information, may serve as an apology for offering these suggestions, and also that the results of a few limited and incomplete experiments on the dry and extracted teeth may be chronicled, which seem to confirm the truth of these statements.

The most prominent acids found in the saliva are, according to Piggott, the "hydrochloric, acetic, lactic, oxalic and uric."

Very recently, a number and variety of teeth, temporary and

permanent, old and young, were immersed in water, one ounce; bromide of potassium, twelve grains; hydrochloric acid, two drops, at different times, and for periods ranging from three to six, twelve, and twenty-four hours. This softened and corroded the enamel, leaving a white powder on the surface, while shavings of cementum, one-fiftieth of an inch in thickness, could be cut from the roots, and remained attached by the ends to the necks.

The results were varied by the quality of the teeth.

At another time, some teeth which had been whitened several months previously (by placing them for a few seconds in a solution of the chloride of soda, an acid being immediately added, and the teeth quickly washed with water,) were subjected to experiment, when full as much effect was produced by immersion in a solution of the strength of the first for a period of three hours, as was in the first instance during a longer time.

Several teeth, varying in age and density, being immersed in a solution composed of water, one ounce; bromide of potassium, twelve grains; acetic acid, three drops, the enamel was corroded to some extent, while the cementum could be shaved off in strips of about half the thickness, as when the effect was produced by the addition of the hydrochloric acid.

In the case of some very hard teeth not much effect was produced.

When the solution was made by the addition of six drops of acetic acid, and twelve grains of bromide of potassium to the ounce of water, for about forty-four hours, the teeth were all acted upon — the cementum being easily shaved off to the thickness of one-fiftieth of an inch, while the enamel was badly corroded.

In a solution composed of water, one ounce; bromide of potassium, twelve grains, and oxalic acid (crystals), six grains, were placed a variety of teeth for a period of forty-eight hours. Most of these were acted upon badly, with varying degrees, though some were not much affected. In most instances the enamel was much corroded, and the cementum softened so as to be easily shaved to about the same depth as in the other case — one-fiftieth of an inch, or more.

A cuspidatus, molar and bicuspid were immersed twelve hours in an aqueous solution of bromide of potassium, twelve grains to the ounce. No effect, excepting on the cuspidatus, in which the

surface of the enamel was softened, and the cementum could be cut from the surface in thin strips. But the action was less than when the acid was added.

All loose tissue, dried blood, tartar, etc., had been removed from the teeth before subjecting them to these experiments, but other acids were not used, for want of time.

Perhaps the iodide of potassium would also be found to exert a deleterious local action on the teeth, to a greater or less extent, varied by the character of the fluids of the mouth, and the quality and composition of the former. In these days of the frequent administration of medicines, more frequent, perhaps, than formerly, because of the increasing multiplicity of medical men and remedial agents, and the greater publicity too, through the press, of the so-called merits of secret and patent preparations, it would not be surprising should the teeth also suffer from the local or constitutional effects of over-medication; for which latter, it is apparent, the present facilities afford, with many ample, temptations to try the effects for real or fancied ailments — many of the former, no doubt, being a consequence of the carrying out of this tendency.

But this does not make less obvious the fact that many remedies of real value, and indispensable in medical practice, are sometimes destructive to, or impair the integrity of, organs with which they may come in contact, unless agents are employed to prevent it; which effects, so far as the teeth are concerned, can usually be neutralized when of a merely local character, without impairing the remedial action of the medicine. And it is quite likely that much yet remains to be learned as to the specific action of certain acid and alkaline medicines in the production of caries, or whether or not they have such action, and the combinations necessary to produce it, and the steps to be taken to prevent it.

In the report on Dental Therapeutics for 1872, allusion was made to the action of carvacrol on sensitive dentine, in which its merits as an obtunder were briefly set forth, it having been first suggested, for this *special* purpose only, by Dr. J. R. Walker, of New Orleans, as was then stated. Subsequently this agent was put into the hands of several prominent members of the profession, who have, for several months, employed it with great satisfaction, not only in this but in other directions; the results of our own experience, and that of others thus far, indicating that it is a more

valuable addition to dental and medical practice than has been supposed, with a *much wider* range of usefulness than was at first claimed for it; not only that, it has been produced in much greater purity and strength than at first; so that it seems to be quite all that can be desired as to quality. From what has been developed in its manufacture and in dental practice, it seems to possess in full strength, or diluted to meet various indications, antiseptic, disinfectant, sedative, mildly caustic and escharotic, gently styptic, stimulant, irritant, rubefacient and carminative properties.

Undiluted, in which state it is employed in most cases, it has more powerful action than glycerole of thymol, and, for some purposes, is more efficient than creasote, while it meets some indications not met by either. Diluted with water in about the proportion of one to three drops to the ounce, it has been found to afford great relief as a gargle in tonsillitis (*cynanche tonsillaris*), the effect being immediately apparent, and the recovery speedy by a few applications. For example, an intelligent dentist awoke in the morning with a very sore throat. A drop of the carvacrol in a wineglassful of water used as a gargle gave immediate relief. Two more gargles during the forenoon effected an entire cure before night. The strength of the gargle can be increased, when more powerful action is required.

In the more severe forms of tonsillitis it would probably greatly mitigate if not cure the disease; and it is believed, from what is known of its properties, and from its *limited* use in this direction, that it would *always*, or nearly always, prove beneficial in inflamed and ulcerous mucous membranes where local treatment could be had. Mouths irritated and made sore by wearing plates are speedily relieved.

We have frequently taken it internally, in very minute quantity, by way of experiment, and for the effect it might have in relieving bronchial irritation; though in the absence of other than personal experience, would not like to recommend its employment in this way, though in our own case the result *seemed* to be satisfactory, and the relief positive — this being the only remedial agent employed for the purpose.

But future and careful experiment can alone determine its full value in general medicine and surgery. It is safe to say that it is not so necessary as with creasote, chloride of zinc, etc., that the

patient does not swallow the slight excess that may find its way to the mouth by judicious local application, or that it be so *carefully* confined to the immediate vicinity of the parts under treatment. But we would not underrate the importance of neat and careful handling of this agent.

In odontalgia, proceeding from exposed pulps, it has remarkable power — the cessation of the pain being instantaneous in many cases, where the usual remedies prove of no avail — the effect of a single application often lasting a week, and in many cases even longer. Of course, it might not prove effectual in every instance. This would be expecting too much of any remedy.

In the hands of the public it would not be likely to abate odontalgic pains so rapidly, perhaps not so fully, as if the cavity was, previous to the application, partially excavated, so that the free contact of the medicine with the pulp could be had; though it seems to penetrate carious tooth substance with greater facility than is the case with most agents of this nature.

Dr. C. E. Francis says, in regard to its efficiency in odontalgia: "It has remarkably soothing effect. I have used it upon exposed pulps with much satisfaction. In cases of odontalgia, arising from irritated and congested pulps, it acts with magic influence. In several cases of terrific toothache, after trying aconite, chloroform, creasote and carbolic acid with little or no effect, I have allayed the pain in each case *instantly* with a touch of the carvacrol. If it had no other virtue, it would, in such cases as these, be an invaluable remedy." For sensitive dentine, "he does not find it much different from creasote or carbolic acid." But it is proper to state that he was then using an article much weaker than that now prepared.

Dr. W. H. Atkinson, than whom a better judge of the action of dental therapeutic agents can scarcely be found, says: "I find carvacrol to be an acquisition to the remedies used in dentistry. It meets some indications not yet met by anything else known to me. It does not cause 'shock' when applied to raw surfaces at all, except when too cold or cool to not disturb super-sensitive tissue. Its 'taste' is objectionable to most, and its 'smell' to many. It fills nearly every indication of creasote in less pronounced degree. I deem it well worth the trial of a much wider introduction in dentistry and general medicine and surgery than it yet has attained."

Dr. G. A. Mills thus refers to his experience with this agent: "I have used the carvacrol since I first received it, which was some time in the early winter. As a substitute for creasote I am not ready to indorse it fully, or either thymol, for I think they are decidedly useful where the carvacrol would not be.

"As an escharotic, it is *mild.* As an antiseptic, it is *mild.* As a stimulant, it is *mild.* As an obtunder, it is quite efficient, particularly in highly organized tooth structure. In such cases I have had a very satisfactory use of it. I am inclined to the opinion that, because of its mild stimulating qualities, is due its kindly action on the highly organized tooth. I do not think that it possesses the disinfecting qualities in anything like the degree that creasote or thymol does. I am inclined to think that a longer acquaintance with it will develop something useful, and worthy a place in the list of our remedial agencies."

To return to our own experience with, and impressions received concerning it. Carvacrol has an odor similar to creasote. Its taste is sweetish at first, afterward scratching, peppery and persistent. If swallowed undiluted, even in small quantity, it is usually and temporarily irritating to the fauces. Its taste is liked by some; disliked by most. Likewise, its odor is objectionable (though slightly to most) and the reverse.

As a gargle, it renders the mouth refreshingly sweet. Our own experience would also indicate that it is useful for disinfecting root canals, for applying to cavities previous to filling, and to pulps before capping. We incline to the opinion that, as a disinfectant, it is quite as efficient as creasote or thymol, while it is more penetrating; to which latter fact, as well as to "its mild stimulating qualities," may be due "its kindly action on the highly organized tooth." To this, also, may be due the effect it has in obtunding the sensitiveness of dentine so quickly; for, if applied to burs while excavating, during the use of the engine, it not only lessens the friction but reduces the sensitiveness, and is, in the latter respect, the best agent that can be employed.

For mild cases of abscess carvacrol is certainly efficient.

One advantage possessed by carvacrol over creasote is, that it makes its *presence* more severely felt when it reaches the seat of the abscess, and thus more apparent to the dentist, than is the case with creasote. While it produces a burning, peppery sensation, it is not

so likely to excite inflammation of the tissues when confined; for instance, in case of an abscess which has not discharged through a fistula, or caused destruction of tissue enough to produce one. A tooth may be sore to the touch, the gum swollen considerably, and there be no discharge of pus, or it may not be present.

If, now, the pulp-canal be cleared of the *débris*, and cleansed, an injection of carvacrol be made into the abscess through the apical foramen, or through the foramen slightly enlarged with a very small drill, and the pulp-canal temporarily filled with saturated ("carvacroled") floss silk, likewise the orifice of the cavity with the oxychloride of zinc, there will be produced (so far as some experience in this direction indicates) nothing more than a slight inflammation of the parts, even were there any. But as before stated, when the agent reaches the seat of trouble, the indications will be unmistakable by the manifested, though not severe, sensations of the patient.

If there is a fistula in the gum, and the carvacrol is forced through, *via* the root-canal, it, being less caustic and escharotic than creasote, does not, like it, leave a white track; and therefore creasote is, in this respect, different, as showing more distinctly its appearance on the outside.

While carvacrol makes its presence in the abscess immediately felt by the patient, who communicates the intelligence, creasote *must*, or it is, at least, more necessary that it *should*, appear through the fistula, that we may know that it has performed its work; and so it is if the elixir of vitriol is employed.

As it is at once apparent when carvacrol reaches the abscess, though there may be no fistula through which it may appear, there would not be so *much* danger from over-medication by the injection of too large a quantity, as there might be with creasote, owing to its being less an irritant than the latter, or in other words, from the fact that it can be employed more freely, with not so much danger of causing inflammation and swelling. But though there is not so *much* danger of over-medication as with creasote, there *may* be *danger*, nevertheless; and notwithstanding there might not, in the majority of cases, be any trouble from this source, recent experience has taught that it should be employed judiciously, particularly in cases of scrofulous diathesis.

We cannot yet say that it would be sufficiently powerful for all

uncomplicated *chronic* cases of alveolar abscess, though such seems to be the fact, so far as experience indicates.

In a case of seventeen years' standing, in the mouth of a married lady, aged about forty, with a fistula opening, and discharging, on the palatine surface, and leading from the root of the right superior lateral incisor, the destruction of bone was somewhat extensive, so that the bare root could be felt with an instrument. The cavity in the alveolus was syringed and filled with the carvacrol, but as this was the first trial of this agent in this direction, it was followed by the elixir of vitriol, lest there might be any broken down alveolus, and for the effect it might have in dissolving it. The fistula was speedily closed without further treatment, and the tooth received a root and crown filling without exciting the slightest inflammation. Here it would be impossible to determine with certainty which agent, or whether both, effected the cure.

But in a case, the report of which follows, carvacrol alone was employed.

The tooth was a perfectly sound but abscessed left superior cuspidatus, in the mouth of a young married woman.

It was a chronic abscess of seven years' standing — the death of the tooth having been consequent, it is supposed, on the loss of alveolus, from involvement with an abscessed lateral incisor root.

On opening the pulp cavity, it was found full of very offensive matter, a dead pulp being removed entire. Two applications of the carvacrol were sufficient to cause the healing of the fistula in the gum, and the parts to assume a healthy appearance. The first was made through the fistula, as the attempt to force the medicine into the abscess through the apical foramen was a failure. This did not entirely check the discharge of pus. A period of twenty days having elapsed, the attempt to inject the carvacrol into the abscess, *via* the root canal, was successful, by the employment of a broach wound with floss silk — the entrance of the agent being immediately followed by a burning sensation. Following the operation, in each case, the root was temporarily filled with floss silk saturated with the medicine, and the crown cavity with the oxychloride of zinc.

No inflammation followed the medication. In two months after the second and last treatment, the patient called with the parts presenting a healthy appearance. This was the third case of alveolar

abscess in which carvacrol was the remedial agent. The second was successfully treated with a much stronger preparation, though of a similar nature, perhaps. This, a small percentage of which was obtained by distillation after all the carvacrol had passed over, we have as yet been able to recover only in one instance, for the reason that it is not usually present, and probably *never* is, excepting in very old material. Its specific gravity, too, is much greater than that of carvacrol proper, the boiling point higher, and its properties — some of them at least — much more pronounced. An analysis may reveal that it is a "new product," hitherto undiscovered.

A German girl, with the right superior lateral incisor aching, and sore to the touch, called for treatment. There was no cavity in the tooth, and no fistula in the gum, though it had previously swollen. Access was made to the pulp cavity (which was found to be full of pus), on and through the palatine surface, by means of the incomparable burring engine. The root was cleansed. The "new product" was pumped through the foramen of the root, into the abscess, by means of a broach wound with silk, as before. It produced a *severe* burning sensation, indicating *unmistakably* that it had reached the seat of trouble. Floss silk was then saturated therewith, with which the root was temporarily filled, the crown cavity being sealed up with oxychloride of zinc. The pain produced soon partially abated, but continued with less severity for two and one half hours. Some slight inflammation and swelling was excited, which soon subsided. In five days thereafter, the tooth being slightly sore to the touch, the treatment was repeated with the production of still less inflammation than before. In a week following the last application, the tooth was entirely free from soreness, with no inflammatory symptoms, and the parts looking healthy.

But these examples will suffice, though others might be given.

The solvent properties of carvacrol are somewhat pronounced. It dissolves gutta percha, or Hill's Stopping, and the ordinary red unvulcanized rubber, very readily, which is as far as experiment has been carried in this direction.

Therefore if the root-filling of silk or cotton is saturated with this agent, the oxychloride of zinc is the best for a retaining plug; that is, a temporary crown filling over all.

Gutta percha, or Hill's Stopping, will be rapidly softened, excepting care be taken to wipe out the excess of carvacrol.

Though the impressions embodied in the foregoing remarks, concerning the action, properties, and manner of use of carvacrol, may be somewhat modified by future and more enlarged experience, it is believed that they will be found to be, in the main, correct.

DISCUSSIONS.

Dr. ATKINSON: I want to make a few remarks in regard to the glycerole of thymol. It has been objected that it produces pain. Now the glycerine being made up of carbon, hydrogen, and oxygen, has a strong affinity for water; and by virtue of this bond it takes the water from the tissues and thus produces the shock complained of.

The objection to using pure thymol, which produces no shock, is that it has to be brought to a high temperature for direct application, and moreover, it is a wasteful method of use. I indorse the use of carvacrol — in fact, of all the carbol series — for they act as disinfectants.

In reference to molecules again, there are two forms of atoms in a molecule of water, and one is a monad and the other a diad — these are the measure of the bonds that unite the two gases to make a liquid, under the potentiality of affinity, when made active by a current of electrism passing within the sphere of influence to marry them in accordance with full satisfaction of their bonds of affinity. My first love was creasote; then came thymol, and then carvacrol. In regard to pepsin, I would say *it* does not dissolve anything. It stands as an embodiment of force — an active principle, enabling the water to dissolve and discharge the deteriorated albumen and albumenoid compounds that are capable of putrefaction if no disinfecting agent be present.

The method of using the pepsin I indorse. At times I also use dilute phosphoric acid along with it.

Dr. TAFT: In regard to carvacrol, I have been experimenting

with it for some time, and in many cases have been exceedingly pleased with it, though it is not alike efficacious in all cases. The subject of therapeutics is of very great importance — one in regard to which there is perhaps as little knowledge among the profession as any other. Very much of the practice of Dentistry partakes of the practice of Medicine. How many men confine themselves strictly to mere manipulation? Few enter on the subject of treatment as they ought.

He concluded by exhibiting to the Association a convenient form of medicinal preparations, denominated Divided Medicines. The medicines are mixed with gelatin, which serves as a vehicle; it is rolled out into squares and crossed so as to indicate the quantity of medicine contained in the limits prescribed. He recommended this for dentists' use, being in a form for administration at once. Medicines thus prepared render the writing formulas and prescriptions unnecessary.

Dr. CHASE said that he had been in the constant habit of using pepsin since last January. That he thinks it very useful in dissolving away the dead pulp in root canals.

Creasote or alcohol will destroy the action of the pepsin, and therefore wax and cotton should be used as a plug to retain the pepsin for the two or three days that it is desirable to keep it in the tooth. Sometimes makes a second application.

Dr. REHWINKEL thought the profession greatly needed a handbook of Materia Medica. He moved that the Committee on Therapeutics be instructed to investigate the action and properties of carbolic acid, creasote, thymol, and carvacrol, and indicate the symptoms or peculiar conditions under which one of these agents was preferable to the others.

Dr. ATKINSON: There is a new invention by Dr. J. B. Wingate, of Carbondale, Pa., called "Depurator," for the treatment of incipient abscess and other local inflammations, which I like very much. It consists of little glass cups of different forms to apply to any part of the mouth or flesh, by which you may operate either dry or wet cupping very neatly and effectually. An air-pump is used to exhaust the air, which it does by a few strokes. It affords prompt relief in local congestions and is perfectly under control. Alveolar abscesses in the sockets of pulpless teeth are readily

aborted by this treatment. It is much more convenient and sure than the use of even the best leeches.

Dr. STELLWAGEN said that in many cases he had gone back to the simple alcohol, and found that it would answer. It was a good bleacher and cleanser, and is frequently as good as the other preparations which had been suggested: the tinctures often acting only as perfumed alcohol.

ACTION

OF

ANÆSTHETIC AGENTS.

By M. H. WEBB, a Member of the Committee on Dental Chemistry.

IN the absence of a report from the Chairman of the Committee on Dental Chemistry, I present this paper, which is submitted only as collateral to that report, and may serve to open discussion upon points more directly related to the subject under consideration. The effect of chemical combination in changing the properties, action and tests of elements cannot be too fully appreciated, and I would especially direct your attention to that part of the paper which touches upon this in the production of anæsthetic effects upon the system.

Certain vapors, as those of ether and chloroform, or a gas, as protoxide of nitrogen, when inhaled, produce a certain result which has been termed anæsthesia — a derivative of the Greek *anaisthaesia* (from α, without, and αισθανομαι, to perceive, or be senible of): anæsthesia, therefore, signifies a suspension of sensation. The action of anæsthetic agents has been said to be "physiological," but as they suspend, to a greater or less degree, functional activity, it would be more in accordance with the true condition of the system, when anæsthetized, to call such action semi-physiological, or tending to pathological. During the administration of an anæsthetic agent the operator can learn that there is a tingling sensation in the fingers and toes, and at the same time, as the influence of the agent reaches the cerebrum, will find that the olfactory ganglia, or bulbs of the olfactory nerves, situated anteriorly and at the base of the cerebrum, become affected — the patient losing the sense of smell. The tubercula-

quadrigemina — the ganglionic centers of the optic nerves — afterward become affected, when a dilation of the pupil is noticed. At a distance back, and below the fourth ventricle, is the bulb of the auditory nerve; and when anæsthesia is carried beyond this and the origin of the trifacial nerve, and the sound of the voice is unheard, one can perform any minor operation, but for those of a greater extent the effect should be carried still further. Too many operate before the functions of the cerebellum and pons-varolii are suspended, at which time more pain will be experienced than if an anæsthetic had not been administered. Many theories have been advanced in reference to the action of anæsthetic agents; Dr. Sansom, in his work on chloroform, stating that they act by "altering the physical character and physical properties of the blood," while Dr. Richardson and others contend that they act "directly upon the nervous system." To sustain this latter theory animals have been submitted to an atmosphere containing a deficiency and an excess of oxygen, the result apparently being in favor of said theory — the animals not becoming anæsthetized. The gases composing that atmosphere were mixed — the nitrogen and oxygen were not combined, but simply lay in juxtaposition, — for from inhaling a mixture of the gases — equivalents, as in nitrous oxide — we fail to observe any effect but that of hyper-oxygenation; whereas, when these gases are combined, as in the gas resulting from the decomposition of nitrate of ammonia, a hypo-oxygenation follows, and we have anæsthesia. Were nitrous oxide to become decomposed and the oxygen disengaged, a portion of which to be appropriated by the blood, the effect would evidently be similar to a simple admixture of the gases. In further support of the theory that anæsthetics act directly upon the nervous system, it has been stated that there is not sufficient time for the action of such agents through the arterial system. The circulation of the blood is completed in about thirty seconds, and anæsthesia, with chloroform as the agent, can be effected in about the same time, evidently proving that anæsthetics have time to act by causing deficient oxygenation of the blood. By atmospheric pressure, brought into play by contraction of the diaphragm and muscles of the chest, the trachea and the larger of the bronchial tubes are filled, and the air is then diffused throughout all the ultimate cells, thus being brought to the blood as it passes through

the pulmonary capillaries. The air-cells are supplied by first contracting and driving off the carbonic acid and vapor, furnished them by the venous blood through the plasma, and then inviting, by their relaxed condition, the advance of oxygen from the atmosphere which passes through the wall of the cell, the wall of the capillary, and to the blood disc, all in about two seconds. When the blood is deprived of its oxygen by the inhalation of an anæsthetic agent, the venous blood does not pass as such to the arteries, because the absence of oxygen does not prevent the carbonic acid being transmitted through the plasmatic tissue to the air-cells, and then driven off by their contraction, except when the blood is surcharged with it, as when an undue supply of oxygen is inhaled — a greater quantity of carbonic acid gas being thereby eliminated — when some may enter the arteries in addition to that normally present; however, when a gas or vapor is inhaled, which, to a great extent, deprives the blood of oxygen, the arterial partakes of the color of venous blood. As the introduction of oxygen into the red corpuscle causes the coloring property — the hematoglobulin, or crourine, — to assume an arterial or florid hue, so in the deprivation of oxygen it remains livid, as seen when the cargo of oxygen is conveyed to the tissues, and the blood enters its venous channel to transport the effete carbon to the lungs, where it is discharged into the broad ethereal expanse.

A province of the blood, then, is to convey oxygen throughout the system, vitalizing and revitalizing every part, and to appropriate, in its recurrent venous circuit, the carbonic acid and vapor resulting from a waste of tissue. As we come to the consideration of the ascending scale of animal existence, from the lower types to man, we find that, like the vasculatory, the nervous system in the lower animals is simple, yet in man it attains an immensity corresponding to his elevated position.

For twenty centuries numerous theories have been in contemplation in reference to this wonderful system; yet, far out into the dim distance of future ages, there doubtless will be revealed new truths, which will emblazon the countless pages yet to be written on this, the grandest subject of physiology. Physiology teaches that there are centripetal, or sensory, and centrifugal, or motor, nerves — the centripetal being, as it were, a labyrinth of cords, like unto the iron nerves spread over a continent, which transmit,

with the rapidity of lightning, to a nation's capital or metropolis, impressions made upon them; while the centrifugal consist of those nerve fibers which ramify throughout every part, and convey that which is communicated to them to its destination. The arteries, whilst lying in juxtaposition to the nerves throughout the system, transmit oxygen to them, and thus maintain their power — the functional activity of the brain and the whole nervous system depending upon a copious supply of arterial blood — blood containing oxygen. Take away this vital principle — let there be inhaled a gas or vapor that will interfere with the oxygenation of the blood, — and we find the whole system affected in consequence, a loss of power is experienced, and, if such inhalations be continued, we have insensibility. Is not this anæsthesia? Those organs presided over by the involuntary and semi-voluntary nerves — the heart and lungs — not becoming affected except where anæsthesia is carried too far, proves, however, that the whole nervous system is not acted upon by the agent, and that before this can be accomplished the effect must be transmitted to the brain mainly through the carotid and vertebral arteries, which carry to that organ about one fifth of the blood in circulation. From the blood pursuing its way onward through the arterial system without its due supply of oxygen, in consequence of the inhalation of an anæsthetic agent, the seat of intelligence (the cerebrum), that of co-ordination of motion (the cerebellum), and the pons-varolii, become affected, and if the medulla oblongata is too greatly influenced, the result will prove fatal. Anæsthesia, then, is the suspension of cerebral function for a time — so far, at least, as the capability of the brain to receive impressions is concerned; and, indeed, is indicative of a general loss of power on the part of the sensorial system, and, when the cerebellum and pons-varolii are affected, an inability to communicate with other parts of the system through the motor nerves. When the influence of the agent has been carried even this far, motion can be communicated by passing a rapid intermittent induction current from the medulla oblongata to the lower extremities, the battery acting as an outer brain, supplying power without intelligence. Dr. Richardson, of England, has demonstrated this by experiments on the lower animals.

When anæsthesia is carried to that extent where the functions

of the cerebrum, cerebellum and pons-varolii are suspended — and but a slight advance would involve the link that binds the patient to existence — the thought should arise in the mind of the operator that before him reclines one whose life is in his hands, and that, were he to allow the influence of the anæsthetic agent so to involve the medulla oblongata as to paralize the whole ganglionic portion of the pneumogastric nerve, the soul might take its flight from its earthy casket and be wafted into eternity. It behooves us, then, to be cautious — to be faithful sentinels; and with a mind well prepared and quick to comprehend, and a hand bold to execute, be ready to wrest all from such impending fate, and thus confer ecstatic joy upon friends of the one who is called once more into all the loveliness of a reviving hope and reanimated nature.

DISCUSSIONS.

Dr. ATKINSON: Though the paper just read could not properly come under the head of a report on Dental Chemistry, he considered it indicative of fresh thought. "Privity of oxygen" was the true cause of anæsthesia. If the subject of chemistry, directly, should be discussed by the Association, he had something to say on crystallography; and something which might throw light upon the subject of calcification and absorption of the teeth.

Dr. BUCKINGHAM: That all anæsthesia is the result of the want of oxygen is an old theory. Were this true, we might give hydrogen, nitrogen, or any other gas which contains no oxygen. Anæsthetics pass through the blood, and, being absorbed, so act upon some of the functions of the body as to deprive them of sensation and the power to act; he did not know how.

Dr. ATKINSON, on being asked, if his theory was a correct one, how he would account for the anæsthetic effect of mesmerism, said: Mesmerism afforded the best evidence that could be adduced in support of that theory. In order to come under the mesmeric influence, the mind must be kept fixed and at rest; respiration and inspiration are gradually arrested, and a general cessation of feeling

and sense ensues. Awaken the mind, restore the function of respiration and inspiration, and a general restoration soon takes place.

Dr. SUMMERS: I do not believe it is the deprivation of oxygen that produces anæsthesia; in fact, I know it is not. If you take oxygen from the system you do not produce anæsthesia. Alcohol has been suggested here as an agent for cleansing root canals. We have no better disinfecting agent than pure alcohol. I use it in the laboratory for this purpose. For preserving meat from putrefaction and maggots, it is the best thing I have found. With reference to the action of acids and alkalies upon the teeth, in the mouth, I am still of the opinion that the alkalies are the most destructive agents. They act upon the pabulum, taking away the base. The presence of acids does not prove that they are the cause of decay. There is nothing so destructive to animal life as the alkalies. Hydrochloric acid acts slowly upon the teeth, but we do not carry enough of this acid in the mouth to destroy teeth.

Dr. BUCKINGHAM: Alkalies may destroy the teeth, perhaps, by overcoming vital force, and by causing the elimination of an acid destructive to the teeth. Alkalies will not destroy a tooth if immersed in them.

Dr. SUMMERS: These alkalies enter the blood-vessels, thus coming directly in contact with the tooth substance through the local circulation, and so destroy the pabulum of which the tooth is formed. [In reply to the question, "Why does it not, then, act upon the bones and other tissues,"] he said: It goes into the blood at a point immediately surrounding the teeth, through the corpuscles, and destroys the pabulum.

Dr. TAFT presumed that any agent entering into the general circulation would affect the general system; but the teeth did not obtain their supply of nourishment from the corpuscles immediately surrounding them.

Dr. ATKINSON thought the truth would be found in the mean between the two theories. Alkalies entered the tooth at the distal end of the tubuli and interglobular spaces, being attracted by the pond of supply.

Dr. OSMOND had observed the evil effects of alkalies upon the teeth. By constant use of baking-powders and soda, the phosphates are eliminated and the pabulum destroyed. In tuberculosis

the phosphate of soda had been found of great service. The rationale of this treatment was to supply the waste of the phosphates. Baking-powders rob the system of the phosphates, and render the secretions acid, thus destroying the teeth. He had observed the deleterious effects of sozodont, and also of soap, upon the teeth. Softening at the margins of the gums would result, if their use was persisted in.

Dr. DOUGLASS mentioned the case of a patient who had suffered from a recession of the gums, on account of the use of long continued doses of bicarbonate, and iodide and bromide of potassium, which had been prescribed by her physician.

Dr. OSMOND recommended the application of nitrate of silver for the cure of the sensitive condition often found at the necks of the teeth. Two or three applications usually effect a cure. It will blacken them, but makes them very hard. To protect the surrounding parts in applying this remedy, he makes a small disc of paraffine and places a drop of the nitrate into it.

Dr. DOUGLASS said that after applying the nitrate of silver to sensitive dentine, or any other part of the mouth, and letting it remain a sufficient length of time, he applies common salt, either in solution or substance, which instantaneously converts the excess of nitrate into chloride (which is tasteless), and prevents its further action, but does not remove the discoloration.

Dr. BUCKINGHAM said a very convenient way to apply nitrate of silver was to use a silver wire which had been dipped in nitric acid, with this the remedy could be carried to any part desired very neatly.

Dr. HITCHCOCK: I do not care to discuss the subject of the relative effects of alkalies and acids upon the teeth; that was settled as long ago as 1843, by Dr. A. Westcott, and I would refer the gentleman who thinks alkalies are so injurious, to the result of these experiments. No one disputes the fact that alkalies act upon the organic portion of the dentine if the enamel is removed. When the dentine is covered with enamel, alkalies do not affect it. Something has been said about soap being detrimental to the teeth. I have a tooth which has been in a solution of fine castile soap for more than two years, and the enamel is, as far as I can see, as perfect and of as good color as when it was first placed in it. I have used nice soap, either alone or combined with

precipitated chalk, as a dentifrice, for more than thirteen years, and consider a combination of soap and chalk the best dentifrice one can use.

I have used nitrate of silver, as suggested in Tomes' "Dental Physiology," and obtain valuable results from it. We constantly meet with the first stages of caries at the necks of the teeth; perhaps there will be a little softening of the tissue, or there may be none. Sometimes it is a little discolored, but very sensitive. My plan is to apply, only to the sensitive spot, a solution of nitrate of silver. It causes no pain, but after a short time becomes dark, the softened dentine, for it is beyond the enamel, becomes hard, the sensitiveness disappears, and a filling is avoided for some time, and, perhaps, forever. Chloride of zinc is used for superior incisor teeth, and it will produce nearly the same effect, though the result is not so permanent.

Ladies often come under our care presenting extremely sensitive teeth, with caries at the necks, more especially of the lower teeth, molars and bicuspids. We feel almost that filling will be useless. Litmus paper is reddened by the saliva, either while the patient is in the chair, or some time during the day. I have been in the habit of ordering, in these cases, the use of bicarbonate of soda in teaspoonful or half-teaspoonful doses, two or three times a day, either just before or just after meals, continued for one or two weeks. I usually find the acid reaction of the saliva has disappeared, litmus paper is not changed; tumeric paper may even be slightly reddened, the cavities have lost their extremely sensitive condition, and filling can be performed with a better prospect of success. We should do what we can to keep the secretions of the mouth alkaline, or at least neutral. Until I feel that gold fillings will prove permanent, I use Hill's stopping.

Dr. STELLWAGEN said that he did not believe that alkalies, such as found in the mouth, had any deleterious effect upon the teeth. He fully understood the osmotic action referred to, an example of which was seen in the immediate effect produced upon the teeth by the introduction of acid or acrid substances. He referred to what had been said by himself, at Nashville, on this point, with regard to experiments made on his own children, by rubbing chalk around the teeth and putting lime-water in their milk, thus hardening the teeth.

Dr. HITCHCOCK — in answer to the question of Dr. Taft, as to what was the action of nitrate of silver when applied to the enamel or dentine — said: I presume it unites with the animal substance of the dentine, forming an albuminate of silver.

Dr. TAFT: My object in asking is to ascertain whether it is necessary to use nitrate of silver. It is the nitric acid that unites with the calcium oxide, leaving the silver oxide on the surface. The nitric acid itself will accomplish all that is desired, and discoloration of the dentine does not follow its use. It can be diluted as desired.

Dr. OSMOND: I have tried nitric acid, and find it produces sensitiveness. In the action of nitrate of silver, it is the silver oxide that unites with the albumen.

Dr. HUNTER: Alkalies, if I understand Dr. Summers, destroy the framework of the teeth, and allow them to break down. This is contrary to the recognized theory that the cause of decay is external and not internal. I have never known a case where I could see any evidence that the cause was internal.

Dr. REHWINKEL: If Dr. Summers' theory be correct, it is certainly very important that it be understood; for if the capillary system possesses the power of absorbing any agent and conveying it directly to any specific organ, we have a powerful adjunct in overcoming local disease.

Dr. BUCKINGHAM observed that the tooth did not get its nourishment from the external vessels surrounding it, but from the general circulation. He used alkalies — caustic potash, for instance — for obtunding sensitive dentine.

Dr. WHITNEY, of Honolulu, said: During the four or five years I was on the Sandwich Islands, I gathered some facts which seem to bear on the point at issue in the beginning of this discussion. Formerly all burials were made in caves, so that 10,000 skeletons to-day may be found in these caves. An accurate history kept by the people enabled me to determine exactly when fruits and acids were imported into the islands. I thought, now can I, knowing these things, determine anything definitely in regard to the effects of acids on the teeth? I went through the caves and examined the teeth of the oldest skeletons, before fruits were brought on the island, and I found that though not perfect, they were not nearly so much decayed as those of later

times. So marked was the difference that I could mark the time, when fruits were introduced, by the teeth of the skeletons. In those fed on fruits there was one in fifty decayed; in the older, one in one hundred.

Dr. FORBES: There is nothing more troublesome or annoying to the dentist than sensitive dentine. There are very few of us who can say to our patients — as Dr. Arthur says he does — "If you do not eat and drink as I direct, I will not treat your case." We have had alkalies, caustics and acids recommended to-day for obtunding sensibility. I have used alcohol and common chalk, and I find in its use all that has here been recommended; for it is well known that manufacturers put nitric acid in their whisky. This is my tooth powder [Laughter] — prepared chalk and alcohol. The more simple the injunctions to our patients, the more likely are they to be followed.

Dr. DOUGLASS spoke against the long-continued administration of large doses of alkalies as medicines, but more strenuously against the use of the mineral acids. He had seen fine sets of teeth ruined by the use of "sour drops" (which are a dilute form of nitric acid), and hundreds of elegant sets whose beauty was destroyed by the muriated tincture of iron.

DISCUSSIONS

ON

OPERATIVE DENTISTRY.

Dr. HITCHCOCK opened the discussion on this subject (there being no report) by presenting some models, on which he explained a case of irregularity which he had corrected by torsion. He said this practice was resorted to in England to a great extent. They would sometimes turn a tooth half the required distance at one sitting, and then, at another, to its proper position. He referred to Tomes and others as authority on this point.

Dr. JUDD called attention to the notched condition of the teeth, so often met with, and alluded to the views of Dr. Hutchinson on this subject, who regards this condition as a pathognomonic sign of syphilis. The speaker remarked that it was something entirely distinct from, and had nothing to do with the disease known as atrophy. He would like to hear an expression of the Association in regard to the views put forth by Dr. Hutchinson in regard to this condition, as a sign of syphilitic taint. The question was of great importance, and, he believed, had never been discussed by this body.

Dr. HITCHCOCK: This is a difficult matter for one in our specialty to determine, unless he has the confidence of the regular medical attendant of the family, or the oculist. Mr. Jonathan Hutchinson, of London, first stated that a peculiar deformity of the teeth was due to congenital syphilis. Other ophthalmic surgeons agree with him. What are the causes of this notched condition? Some believe it to be due to specific stomatitis occurring while the teeth are forming. An oculist informed me of a case in which a lady carried her daughter to him for the treatment of in-

terstitial keratitis. He noticed the notched teeth, these two conditions often going together as result of congenital syphilis, and asked the mother if the daughter had had any eruption upon the body during infancy. The next day he received a note from the father suggesting that he should cease his interrogations.

Dr. STELLWAGEN: In the wards of the Philadelphia Hospital, one of the largest eleemosynary institutions in the land, I examined the mouths of the children, with a view of satisfying myself on this point. The results were not confirmatory of Hutchinson's observations. I was so little encouraged by my examination, that I have not paid much attention to it since. Negative results, of course, do not prove the assertion is without foundation. I think I saw numbers whose parents were tainted.

Dr. HITCHCOCK: Had the parents had inflammation of the mouth? I think it is not claimed that the offspring of every person who has had syphilis, develops this notched condition, but when it does occur it is referable to syphilitic taint.

Dr. JUDD: Dr. Hutchinson was employed almost entirely in treating hereditary disease. He has not made many observations on healthy parents. Now can *we* find this notched condition where there is no hereditary taint? This is what we want to know, I think. If our attention is directed to it, we may determine this. If we can find one case of the sort we can state positively that it is not a pathognomonic sign. Hutchinson does not think that it will apply to the deciduous teeth.

Dr. STELLWAGEN: It is almost impossible to satisfy ourselves that there is no hereditary taint. I know some most sad cases of contamination of infants, carried by nurses to places where it was imparted to the lips of the little innocents by contact. The children are forever contaminated.

Dr. TAFT raised a point of order, that this was not the subject under discussion.

Dr. HERRIOTT: Some have experienced trouble in the use of burring engines, on account of the wearing out of the burs. I have heard it surmised that they lose their temper on account of the heat developed by the friction. I was surprised to learn that anyone should use the bur, in such a way as to destroy its temper by heat. It is a great mistake to apply the bur constantly, while preparing the cavity and making retaining pits, until it becomes

heated. It should be used, intermittingly, not using it long enough to become heated, or to heat the tooth.

Dr. CARROLL: The small burs are either lacking in temper or in the quality of steel of which they are made, for after the second or third time they are used they are almost worthless. I cannot think this is the result of rapid revolution, for I could use the old finger-burs a month, imparting great velocity to them, before they became badly worn.

Dr. McDONNELD: I have met with difficulty on this point myself, and am satisfied that it is due to the velocity with which they are turned. They should be kept surrounded with moisture. I have come to the conclusion that it is heat which causes the trouble. A small bur would lose its temper where a large one would not. I have adopted Smith's drop-stopper to keep the surface wet.

Dr. EAMES: I noticed in an English journal that the dentists in London had met with the same difficulty. They had made arrangements for overcoming it by having a tank with a flexible tube attached, so as to conduct water to the bur, and the flow was regulated by a thumb-screw.

Dr. TAFT: The common rubber-ball syringe answers well for this purpose. I desire to call attention to the cleansing and polishing of teeth. We frequently find deposits on the teeth, as green stains, in the mouths of young persons—especially on the anterior surface of the superior teeth—also roughness and abrasion. The ordinary method of polishing involves a great deal of labor. I have been using Dr. Baxter's little cones of Arkansas stone for this purpose. I apply them with Dr. Morrison's engine, and they clear away all the roughness, and polish the teeth completely. Nothing else is required, as they leave a polish nearly as perfect as that of the natural enamel. [Various forms of the stone were here exhibited.]

Dr. HERRIOTT: I think dentists will find no trouble from the heating of burs, if they use the air-syringe. Morrison's engine is a fine thing, but we need one that will not restrict the freedom of our bodies. The discs furnished us are exceedingly frail, and great care is needed in using them, both for the safety of the burs and of the teeth.

Dr. KNAPP: It was suggested at Niagara that sensitive dentine

had better be operated on when dry. I apply the rubber dam before removing the loose material. All agents are more effective if applied when the cavity is dry. You need not operate so rapidly as to heat the bur, but you had better not wet the cavity. A young lady came to my office, crying, in dread of the operation. I adjusted the rubber dam, removed the loose material from the cavity, then applied carbolic acid. The operation was a little painful at first, but she got through very comfortably, in view of what she had expected. You had better pay for more burs than to wet the cavity while excavating.

[At this point the discussions were interrupted by the President's announcing that a gold medal had been forwarded to him by the California State Dental Association, with the request that this Association present it to Dr. S. C. Barnum, in behalf of that Society. He accordingly called upon Dr. C. C. Knowles, of San Francisco, to make the presentation, which was as follows:]

Mr. President and Gentlemen — In the divine order and fitness of things, it seems eminently proper that I, as the representative of the "California State Dental Association," should be called upon to present this gift to the gentleman for whom it was designed, and I thank you, sir, for the honor, but regret that this request was not made in time to allow me to choose words more fitting to the occasion, and better expressing the sentiments of the donors.

The history of this gift had its origin in a discussion of the VULCANITE RUBBER question, and the attitude of its owners and their agents in their illiberal policy, as contrasted with the value of the RUBBER DAM, and the generosity which dedicated it to the profession.

In 1872 a committee was appointed to take the matter in hand and report some suitable method of expression, and this is the result.

Dr. Barnum, allow me, in the name of the "California Dental Association," to present you this bauble as a small token of the esteem and respect in which we hold you — not so much upon personal considerations as in recognition of that genius which invents, and that generosity which confers benefactions on our kind. You are mostly indebted for the shape which this expression of our appreciation has assumed, to the persistency of Dr. Dennis, Chairman of the Committee, and for the beautiful design, to Dr. Dutch. Take it, sir, and may that spirit which erects monuments of stone to the posthumous memory of earth's benefactors never deny you bread while living.

Dr. BARNUM: *Mr. President and Gentlemen* — This is indeed a beautiful testimonial. God knows I am truly grateful for the kind appreciation it evinces. I like it, not for its intrinsic value, so much as because it tells me that the value of my little effort has been generously recognized by the donors. I would that I had words to properly express myself. Gentlemen of the

American Dental Association, you have all treated me kindly, and I thank you. If I could do more I would cheerfully do it. I have never regretted giving freely to the profession what I might have made lucrative to myself. I don't ask for money — that I can work for — but this testimonial I look upon with great satisfaction. I shall take occasion to return my thanks to the Society from which it came, by letter, when I can write in chosen words Gentlemen, again I thank you all.

Dr. MORGAN, in reference to the Arkansas-stone points, said: Dr. Hamlin and myself tested these points in connection with pumice, and other means in common use for removing the green stains on children's teeth, and polishing the surfaces, and we found that these points did the work much more rapidly, and left a more perfect and lasting surface. While teeth remained clean and smooth, after being polished with the Arkansas stone, others, in the same mouth, which had received as good a surface as we were capable of giving them by other means, would become coated again.

Dr. FORBES asked Dr. Knapp, if the absence of pain, in excavating a cavity of decay, after the application of the rubber dam, was not due to the counter irritation produced by the appliances.

Dr. KNAPP: I think not.

Dr. CHUPEIN: I have had cases in which it was impossible to touch the dentine with an instrument, owing to its sensitiveness, when, after adjusting the dam, I was able to excavate without difficulty and with little pain.

Dr. CARROLL: I fill no teeth without the aid of the rubber dam. It facilitates all the preparatory operations, as well as that of filling.

Dr. McDONNELD: I have been using it for some years with success. But my previous experience has taught me that I can fill many cavities, where the dentine is not sensitive, without resorting to it. It is the height of folly to torture a patient for nothing. In simple cavities I would think its application smacks of the inquisition.

Dr. JUDD: When the rubber dam was first introduced, its application was attended with a good deal of difficulty. Dr. Barnum had given us a clamp, but it failed to meet all cases. Other means were from time to time suggested for holding the dam in place, and yet there were cases frequently met with where all these failed.

To meet some of these cases, Dr. Eames and myself had a clamp constructed, about four years ago, which is identical with the Allen clamp now in use, except it was made round, instead of being flattened. This is undoubtedly one of the best forms of clamp we have. I apprehend that some fail in its use for the want of a full understanding of its application. The clamp should be placed on the tooth first, then pass the dam over the clamp, and stretch it down over the tooth; pass a ligature between the teeth in front of the clamp, carry it round behind the clamp, and tie with a single knot on the buccal or mesial surface of the tooth.

Dr. TAFT: I saw the first samples of this appliance in New York, two years ago or more. It was made by Dr. Delos Palmer. His is better than the Allen clamp. There are cases in which annealed copper wire can be used with benefit — when the tooth is so conical that the clamp will slip off.

Dr. STELLWAGEN called attention to Dr. Jack's use of gold-beater's skin for laying over exposed pulps, before applying oxychloride of zinc. He stated, further, that with keen instruments the most sensitive dentine could generally be excavated with comparatively little pain. He used Dr. Palmer's fine instruments, and he had not believed, before trying them, that it was possible to get so keen an edge to stand as these do, when cutting enamel or dentine.

REPORT

ON

DENTAL HISTOLOGY

AND

MICROSCOPY.

By THOMAS B. HITCHCOCK, Chairman of the Committee.

THE facts shown by Kölliker, in regard to the development of the teeth of ruminants, were shown by Waldeyer, as early as 1865, to be true also with reference to the development of the human teeth. They proved the observations of Arnold and Goodsir in regard to the teeth papillæ rising from an open dental groove to be incorrect.

The first indication toward the formation of a tooth is seen in a fold of the oral epithelium, which projects into the jaw, and, expanding, gradually takes the shape of the enamel cap of the tooth. The fold of epithelium is doubled upon itself, and it is the inner layer, internal epithelium, in which the enamel cells are developed. Shortly after the dipping down of the epithelium, and before it has expanded, there occurs a proliferation of cells just below, which under a low power of the microscope presents a darker appearance. This is the first rudiment of the dental germ or pulp. As development proceeds, this appearance becomes more marked, and the tissue assumes the shape of the dentine of the tooth which it represents. (Plates I. and II.)

The oral epithelium covers the surface of the dentinal germ, the space between the folds being filled with cells. The cells of the internal epithelium, next the dentinal pulp, become lengthened, are supplied with numerous nuclei, and finally assume the shape of the well-known cells of the enamel organ. (Plates III. and IV.)

The cells forming the dentinal germ or pulp, which at first were irregularly situated in their blastema, have become nearest the surface larger, and lengthened; have one or more nuclei, and after dentification has commenced, present the prolongations extending into the formed dentine, which we call dentinal fibrils. (Plate V.)

The cells or odontoblasts have, beside this process, to which Waldeyer has given the name of dentinal process, others, which he calls the pulp process and the lateral process, and which extend inwards, toward the center of the pulp, and laterally, communicating with other odontoblasts and reparative cells. Sometimes there are as many as six of these processes from a single odontoblast.

Observers are not agreed with reference to the termination of the dentinal tubes.

Wedl is inclined to think that they form by their anastomoses an inclosed system. The line of junction of the enamel and dentine is generally well marked, the dentinal tubes not extending into the enamel. Mr. J. Tomes, however, says some of the tubes pass across the line of junction into the enamel. Kölliker holds the same opinion, as also does Mr. C. S. Tomes.

Hertz and Waldeyer, however, inasmuch as they have been unable to verify these observations, differ from them, the latter saying a direct passage of the dentinal tubes into the enamel does not occur.

Examination of Plate VI. seems to prove that at times the dentinal tubes do penetrate the enamel, and that to a considerable depth. Physiologically, may not this account for the extreme sensitiveness which we sometimes find in the enamel while preparing cavities for filling?

With reference to the ultimate distribution of the nerves of the pulp, no new investigations have been recorded during the past year. The investigations of Dr. F. Boll in 1868, who was able, in the teeth of rabbits, to trace certain fine pale fibers, which were side by side with the dentinal fibers, and which he therefore believed entered the dentinal tubes, till he found them continuous with medullated nerve fibers, have been verified by others, and are received by many histologists.

Czermack first described the interglobular spaces. In examining for them Mr. C. S. Tomes tells us that they will be much

more readily seen if the teeth from which sections are cut have been first boiled in wax. They are found in nearly all teeth, and are not confined to the teeth of man. Mr. C. S. Tomes says they sometimes are obliterated by undergoing calcification, when the appearance described as "areolar dentine" is seen. (Plate VII.)

Waldeyer says they "are the result of a somewhat irregular process of dentification."

Prof. Wedl holds the same opinion. The latter states also, that sometimes in the teeth of elderly persons there is seen an increase in the number and size of the interglobular spaces, that they are often filled with amorphous calcareous salts, and that they are occasioned by interstitial absorption of the dentine.

The publication of English editions of Wedl's "Pathology of the Teeth," and Leber and Rottenstein on "Dental Caries," and a second edition of Tomes' "Dental Surgery" during the past year, has furnished us with several new observations in regard to the theory of dental caries. These are based upon the microscopical appearances presented as the result in many experiments, not only upon living teeth, but upon reinserted human teeth and teeth made from ivory.

Mr. J. Tomes and Dr. E. Magitot supposed the translucent zone of dentine in advance of caries was the result of a vital process, a consolidation of the dentinal tubuli, whereby the tissue was rendered more dense, and therefore less readily acted upon by the agents producing caries. It has, however, been shown by Leber and Rottenstein that this change occurs in human teeth which have been inserted as artificial teeth, and that the same appearances as regards the translucent zone, thickening and swelling of the tubes and fibrils, and discoloration, are found, as in caries of natural living teeth; moreover, these authors found almost precisely the same changes occurring in teeth made from hippopotamus ivory. They attribute the translucency to a chemical solution of the calcareous salts, which near the termination of the tubes is washed out; deeper in, however, and in contact with the alkaline fluids of the tubes, the salts are precipitated as calcareous grains. The thickening and swelling of the tubes and fibrils is due to the decalcification of the tube walls, and to the presence of the fungus growth "leptothrix buccalis."

This fungus, which is plentifully found in tartar and about the

necks of the teeth, is an active agent in the decay of the teeth. In fact, Leber and Rottenstein are of the opinion that after the enamel is penetrated by acids, or by mechanical injury, the fungus penetrates the dentinal tubuli, where it rapidly proliferates, destroys the fibrils and enlarges the tubes. They claim that after a lodgment upon the dentine is effected, even where it is not previously softened by acids, leptothrix rapidly destroys the tissue. Prof. Wedl, on the other hand, while admitting that leptothrix hastens the destruction of the dentine, considers the action of acids the more active cause, leptothrix not attacking any portion of the dentine until it is first softened by caries and deprived of life.

The appearance of leptothrix is very well shown by Leber and Rottenstein and by Wedl. On the surface it resembles short, straight filaments. Mr. J. Tomes, in 1848, in his "Dental Physiology and Surgery," speaks of the presence of fungus growths in caries of the teeth, and describes one as "consisting of straight, stiff fibers or threads, so small that the structure cannot be seen. * * * They look, with the lower powers of the microscope, much as ordinary mould does to the naked eye." This answers very well as a description of *leptothrix filaments*. These filaments are seldom found in the dentinal tubuli; here the fungus presents a granular appearance, and is called *leptothrix matrix — elements* or *grains*. Softened dentine will be found full of these grains, which can readily be distinguished under the microscope. Leber and Rottenstein have also shown that the action of a dilute acid and iodine upon leptothrix gives a violent reaction.

The leading observers, with perhaps the exception of Neuman, Hertz, and Magitot, who ascribed the changes in advance of decay, in the dentinal tubuli, to a vital process, have accepted chemical action in connection with leptothrix as sufficient to produce these changes. Tomes, in the last edition of his "Surgery," says: "Inasmuch as no characteristic appearances can be found to distinguish caries as occurring in living from that attacking dead teeth, it seems that the hypothesis of vital action in any way modifying the disease must be abandoned in toto."

Still there are vital changes, an increased activity of the odontoblasts, occurring in teeth which are the subject of caries or other irritating causes, which is manifested by the formation of secondary dentine, which in many cases is so formed as to protect the pulp

from invasion by the disease. The new formations are readily distinguished under the microscope. (Plate VIII.) They are not necessarily adherent to the walls of the pulp cavity, but often occur as small roundish granules in the pulp tissue. Sometimes they present a series of laminations about a common center. They are well described by Wedl.

Several interesting cases of repair of fractures of the teeth are described by Wedl, and plates given, showing the nature of the tissue of repair. He shows this to be composed almost entirely of dentine and osteo-dentine, developed from the tooth pulp; the part taken by the cement being only secondary.

Of the manner in which teeth of replantation become firm, Mr. A. Coleman, in a paper read before the Odontological Society of Great Britain, in 1870, states that examination of a superior molar which had been extracted and replaced, and was again removed at the end of thirty days, showed a dense fibro-cellular tissue, which was adherent to the dentine, and apparently projected into it. The dentine in the immediate vicinity of this new tissue seemed to have lost its distinctive character. Alluding to the tissue, he says: "Appearances seemed to point to its belonging more to the tooth than to the surrounding structures," but adds, "it seems more easy to suppose that it had originated from the periosteum of the socket, and had become, by absorption of the tooth and a dovetailing into its substance, firmly attached to it, although all appearance of such attachment was lost." Mr. Coleman, and also Prof. Wedl, refer to the experiment of Dr. Mitscherlich, who removed an incisor tooth from a dog's skull and placed it in the alveolus of a living dog.* After an interval of six weeks the dog was killed and the carotids injected. Examination of the tooth showed it to be firmly attached to its socket. He found that new formations of osseous tissue had grown into the cavities and depressions on the root of the tooth. He believed the new growth was developed from the lining membrane of the socket, which first caused absorption of portions of the root, and having projected itself into the cavities thus made, it became ossified. A section of a living tooth which was replanted, became firm, and was worn four years, showed, under the microscope, a new formation of cementum over the original. From this we would infer that, under certain conditions, new growths from the membrane of the root also may be the

* This was transplantation of a dead tooth, and should be distinguished from replantation.

means of fastening teeth of replantation. (Plate IX.) The new tissue, however, is more liable to absorption, causing loosening and loss of the replanted tooth, which we know is sooner or later the usual result.

The nature of the membrane, which Nasmyth discovered could be raised, by the use of an acid, from the crowns of unworn teeth, has been the subject of some discussion. The view held by Kölliker is, that after the complete calcification of the enamel cells, a secretion occurs which covers the entire surface and forms a protecting layer. Prof. Rolleston, in a paper read before the Odontological Society of Great Britain, 1871, ascribes its origin to the imperfectly calcified ends of the enamel cells, which become hardened or cornified. Waldeyer states it to be the cornified cells of the external epithelium of the enamel organ. He says that after treating it with a solution of nitrate of silver the epithelial cells may readily be seen. Mr. J. Tomes supposes it to be, not a product of the enamel, but of the cementum. He gives instances in which the cement extended over the enamel and into the fissures upon the crown. Prof. Wedl also supports this view, and gives an illustration of a molar tooth over which an enormous quantity of cement has grown. Mr. C. S. Tomes, in an article in the "Quarterly Journal of Microscopical Science," October, 1872, gives the result of his later investigations. He found the cement which fills the fissures of the enamel to be continuous with the *cuticula dentis*, and by the aid of an acid the whole could be removed, including the thicker portions containing the lacunal cells. (Plate VII.) As the membrane raised in this manner presented the same appearances upon the root of the tooth, and was continuous with it, he concluded it to be that thin layer of tissue which is in contact with the last formed cement, and which lies between the cement and the soft tissues. He says, "on the border of perfectly calcified structures there exists a thin stratum of tissue which presents marked differences from that which lies on either side of it; one of the manifestations of such difference being that great indestructibility which enables us to isolate it by the use of acids. Nasmyth's membrane appears to belong to this class of structures." Mr. Tomes' paper contains many strong arguments, and does more to settle the discussion in reference to the nature of Nasmyth's membrane than anything previously presented upon the subject.

DESCRIPTION OF PLATE I.

Longitudinal section of the jaw of a human embryo, showing tooth germ. The dentinal germ is seen in the shape of a papilla. The fold of epithelium is seen dipping down, the two layers separated over the papilla, forming the enamel germ, organ, which presents a darker appearance, bounded above by the external and below by the internal epithelium. In cutting the section an accidental space was formed between the dentinal and the enamel germs.

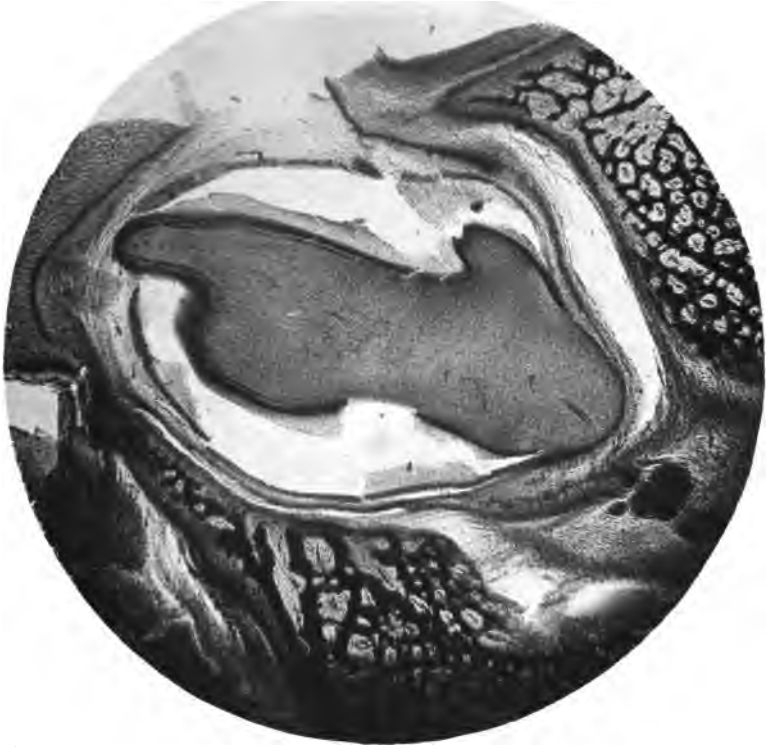
Magnified 100 diameters. ¼ inch objective.

1-100 of inch.

DESCRIPTION OF PLATE II.

Transverse section of the jaw of a fœtal calf, showing tooth germ. The dentinal germ has been distorted, and the enamel organ torn, in making the section. Some of the vessels may be seen in the dentinal germ; the dark line which bounds it is the developing odontoblasts internally, and the internal epithelium of the enamel organ externally. The lighter tissue beyond is the stellate reticular tissue, or, gelatinous layer, beyond which is the external epithelium; then comes the tooth sac of connective tissue, and the osseous trabeculæ of the alveolus.

Magnified 12 diameters. 1½ inch objective.



DESCRIPTION OF PLATE III.

A portion of the enamel organ from the tooth germ of a fœtal calf.

The enamel cells contain numerous nuclei.

Magnified 260 diameters. 1-10 inch objective.

1-100 of inch.

DESCRIPTION OF PLATE IV.

Section of enamel from the tooth of a dog. The dark places in the picture are caused by cracks in the section. Enamel prisms are seen longitudinally and transversely, in alternate bands. In those cut across transversely the roundish and hexagonal shapes may be seen. The shape of the prisms being determined by the amount of pressure to which the cells are subjected at the time of their calcification.

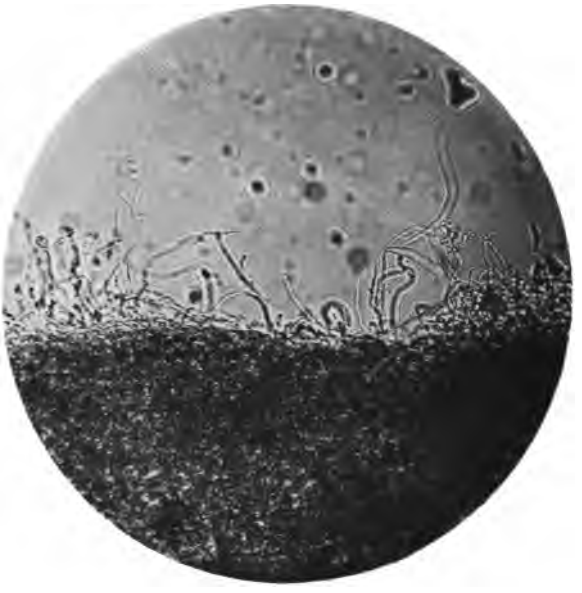
Magnified 260 diameters. 1-10 inch objective.

1-100 of inch.

DESCRIPTION OF PLATE V.

A portion of the root pulp of a molar. A freshly-extracted six-year molar, was cracked in a vice and placed in very dilute chromic acid (1-25 of 1 per cent.) for about an hour. On carefully removing the pulp from its cavity, the fibrils were drawn out from the dentinal tubes. Some of the fibrils show branches.

1-100 of inch.



DESCRIPTION OF PLATE VI.

Section showing the penetration of dentinal tubes into the enamel.

The enamel with its fractured edge is seen at the left. At the right of the lighter boundary line is the dentine; tubes may be traced across this line in great numbers.

Magnified 100 diameters. ¼ inch objective.

1-100 of inch.

DESCRIPTION OF PLATE VII.

Section of a tooth showing faulty dentine, containing interglobular spaces.

The fainter spots toward the bottom of the picture are areolar markings. At the upper part, the enamel is seen with a fissure in it extending almost to the dentine; in the fissure, which is bordered by the *cuticula dentis*, is seen, somewhat out of focus, a lacunal cell.

Magnified 112 diameters. 1/4 inch objective.

1-100 of inch.

DESCRIPTION OF PLATE VIII.

Section of a superior central incisor. The right of the plate is toward the cutting margin; a small piece of the enamel is seen at the right-hand upper margin of the plate. The uneven margins above and below show the walls of cavities of decay. The dentinal tubes are faintly seen in portions of the section; in other places they are obliterated. The reddish yellow color, which in the section of the tooth bounds the caries, also contributes to the darker appearance of these portions of the picture. Internal to this, and taking the shape of the former pulp cavity of the tooth, is a lighter tissue, the new formation, secondary dentine, the dentinal tubes of which are seen to be very irregularly disposed. The clear space at the left of the secondary dentine is the present pulp cavity. It is evident the pulp would have been exposed by the caries upon the upper portion were it not for the new formation.

Magnified 12 diameters. 1½ inch objective.

DISCUSSIONS.

Dr. JUDD: In relation to these calcific deposits and new formations, referred to in the report on Histology, these formations are sometimes continuous with the dentinal structure, and, at others, connected with the pulp, and confined to the pulp chamber or nerve canals. There is a characteristic difference in the structure of these formations, apparently dependent somewhat upon their locality. Those found in the pulp chamber approach more nearly to the tooth structure than do those which are connected with the dentine. I have seen specimens containing well-developed dentinal tubes; others seem to possess no characteristics of dentinal structure. A recent specimen, which I prepared and examined, had all the appearance of dentinal tubes arranged in regular order, and as distinct as I have seen them many times in the healthy dentine. The influence these deposits have upon the dental pulp is various — many times causing intense neuralgic pains. These nodules in the pulp chamber are formed quite frequently in perfectly sound teeth. In reply to Dr. Taft, in regard to the treatment, I would open into the pulp chamber and remove the nodules, treat as in simple exposure, or remove the pulp entirely and fill. Sometimes these formations extend up into the canals, making their removal very difficult.

Dr. HITCHCOCK: In the cases referred to, you are very likely to find the cementum increased on the root.

Dr. MORGAN: As Dr. Judd has remarked, these nodules are frequently found in the nerve canals; and I think I have noticed that the pain consequent upon their presence is more acute when the nodule is connected with the dentine than when connected only with the pulp. In these cases I have sometimes observed an increase of the cementum.

Dr. ATKINSON congratulated the Association on having men who could make such observations as these.

He thought the calcification referred to in these cases indicated a return to lower types of dentification, as in the ruminantia, etc.

He said he had seen cases of long standing, which were probably attributable to want of exercise, by the patient avoiding vigorous masticatory efforts, and also sleeping with mouth open and jaws apart, depriving the teeth of the stimulus of hard contact, oft-repeated and long-maintained, which is the *sine qua non* to healthy development and effectual service of these organs.

In these cases of irregular and imperfect calcification of the bodies and processes of crown and root pulps, the size of the chamber and apical foramen become reduced, sometimes lessening, and at others stopping, the vascular circulation. In cutting such teeth in section, after extraction, had seen the nodular pulp hanging in mere shreds of pulp tissue, containing nodules, rods and spicula of calcified material in abundance. He indorsed the removal of loose nodules, and filling at once.

Dr. SMITH: A case came under my observation, bearing on this subject, which I will relate. A young man, suffering excruciating pain, had been under the treatment of a homœopathic physician for neuralgia, and finding no relief, applied to me. I examined the teeth, and found a filling on the grinding surface of the six-year molar. I removed the filling, and struck upon a stratum of ossified substance. Not being satisfied that the pulp was healthy, I penetrated into the cavity, and the gases evolved satisfied me that the disease was the result of pressure upon the living portion of the pulp. These cases should induce medical men to be more careful in their diagnosis.

Dr. CHASE had made a microscopical examination of the central portion of the crown of the six-year molar, in which many osteal cells were seen at the *large* ends of dentine tubes. The specimen was made of decalcified tooth substance from above the pulp cavity, which latter was not exposed.

ESSAY

ON

HISTOLOGY AND MICROSCOPY.

By W. H. ATKINSON.

THIS is a broad subject, deeply involved, complicated, profound, and occult; but beginning to take on scientific aspects.

Anything like a satisfactory account of the rise and progress of histology would involve a conspectus of the origin and career of the whole range of Natural History, Medicine, and Surgery. The study of these departments has brought to view whatever is known of histological or microscopic science.

The mere fact of our being in possession or not of the knowledge of science, art or commerce, neither creates nor annihilates any part, nor the whole, of the categories referred to. For they must be, to become catalogued as knowledge. Therefore the knowledge does not make or unmake any part of the field of contemplation in scientific or social order of life.

The so-called "exact sciences" become exact only by lodgment in the minds of those capable of comprehending the processes by which they are rendered regular and certain; or, in other words, by our becoming acquainted with the nature and career of physical and mental processes.

Histology can only be known through direct revealment to the consciousness, or indirectly through microscopical machinery. Hence the great propriety of coupling the two (histology and microscopy) in the caption of a paper setting forth whatever may be provable to the senses in the career of tissues and their elements in *associate* and *dissociate* presence.

This first glance at the subject startles us as we begin to take it into our consciousness in its comprehensive and dispersive aspects; for it really strikes at the foundations and superstructures of all knowledge of all kinds and degrees.

The MICROSCOPE is comparatively a modern invention. Therefore, there was no real knowledge of tissues before its discovery, invention, construction and employment; or, what was known came into consciousness through other channels. In fact, the possibilities and principles of the microscope had to find lodgment in the mind before it could be discovered, invented, made and used—each stage of the progress of the revealments of principles and possibilities, no less than the final summation, solution and applications to practice, requiring immediate influx. When we shall know what influx is, and be able to express it in understandable phrase, we shall have a basis of certitude in this department of science, as absolute as that known to pertain to the relations of number. All becoming, in physics and consciousness, depends upon afflux and efflux, and is only capable of cognition when complete. Just here is the great hindrance to equable and certain progress in attainment.

The recorded categories of past observations are so vague and embryonal, that they do not meet the mental appetite of the present with statement sufficiently strong, broad and clear to satisfy. All search for new and complete categories must proceed upon immediate influx, or recapitulations of former influxes, in reasoning upon the known to reach the unknown.

It will be profitable for us to ask what reasoning is, and to learn that it is a holding of the values of canceled processes in a sort of compressed essence in such a state as to polarize the mind so as to admit of a new influx (revelation) of the knowledge desired. Thus *sentiment* is inherited essence of logic, and by no means to be scouted or disregarded as non-essential to the attainment of truth.

Career of body and being, fact and function, in physics and consciousness, involves the questions of origin and destiny, or plan and purpose, in mode and manner of differentiation and indifferentiation of occupancy of habitat.

Confluence and diffluence are the diastole and systole of career to the departments in which they occur.

Body is echo of body, as shadow is sensuous proof of substance — substance being the substrate of spiritual and material forms of body — there being no possibility of body that does not partake of the dual primates of substance called spirit and matter inhering in it, in dynamic interdependence.

Histology to-day is crippled most in the house and hands of its own children and friends, by their persistence in carrying questions and methods of one category into another to which they are not adapted in nature, significance and use. For instance, it is still held to be important to "settle," as they say, the "priority" of "body or germ," "oak or acorn," "egg or hen." It is not yet "settled" what "germ" or "body" is. How then can "priority" of presence in any category be determined? Whether minutest granules shall be regarded as eggs, and what degree of ripeness of these shall constitute fitness for impregnation, or whether a sort of parthenogenesis holds genus, species and variety in its potential grasp, is not yet "settled" for all the forms already known. How infinitely less, then, can be "settled" the verities of the vastly more extended fields of the unknown bodies and careers that now so vehemently press for scientific revealment in the study of a true histology, until we can cancel and cast behind all that stands in the way of solution of body and process?

When we depended for demonstration of elemental bodies upon natural vision, we could only go to tissues as elemental. But when the microscope was revealed, the present acknowledged elements of these then elemental bodies were revealed to sight, and at once became the objects of study and controversy. And we now stand on vantage ground, and are able to solve previously insoluble problems of presence, and modes of presence of body and process. What, then, ought we to be ready to cancel and cast behind? Nothing of value, only the embryonal and transitional — not the fruits of these in values of verity.

At one time, and for the time appropriately, the solidal pathology held sway. In due time the fluidal made its advent upon the arena of function, and had its day of domination; but of shorter duration, in consequence of increasing intelligence and attention, the continued exercise of which in turn made it give way to the advent of the cellular pathology, ushered in by the use of the microscope. And now this is about to give up its differential dominion in

favor of the summation of all three in the concurrence of these in Pragmatic Pathology.

Pragmatic, or pronounced, pathology can only find lodgment in the minds of men by the study of body and process upon a plan so natural, general and definite, as to convince of its verity and applicability to the categories of function.

That every factor of function must be, before it can act, and act repeatedly in like manner to establish habit by which it may be known, must be apparent to all capable of thinking upon the subject.

The law of becoming, in body and function, is the law of succession or parentage.

Becoming can only be known by *revelation* to consciousness.

A seriating, then, of motion and modes of motion, is a necessity out of which categories may be evolved.

There are seven degrees or modes of motion regnant in the plan of individual being, small or great. And these may be nominated either way, but always in a regulated series down and up, or up and down.

DOWN.—1st, (Spirit) Power; 2d, (Vital) Force; 3d, Chemism; 4th, Electrism (including magnetism); 5th, Light; 6th, Levitation, and 7th, Gravitation.

UP.—1st, Gravitation; 2d, Levitation; 3d, Light; 4th, Electrism; 5th, Chemism; 6th, (Vital) Force, and 7th, (Spirit) Power.

The first or downward procession indicates what has been called "Creation." The second or upward procession is, Procreative, Functional, Elaborative, or Relegative (a seeking to return whence it came), and is the basis of *associative* and *dissociative* movements among the elements of tissues.

Gravitation holds the dominion of differential individuation. *Spirit* holds the dominion of indifferentiation, or sameness of all power and presence, and is the unitary cause of all motions and modes — therefore, the universal of BEING in highest tension.

A striving between these two modes of tension produces Suns, Systems, Cycles, Circles, Planets and Inhabitants of Planets.

The tissues of our bodies hold the relations to the organs that the inhabitants hold to planets, and the organs hold the relations of circles and cycles to the system of organs that constitutes our individual bodies.

"Just as the study of the whole class of *Radiates* in general, and of jelly-fishes in particular, reveals the law, plan, type and methods of production (that so long defied proper classification, and now shows these methods of production and variation repeated and amplified in the higher and more complicated fields of geological research), and without an apprehension of which, persistently carried in the mind, can any zoologist make regular, rapid and profitable observations," even in the special department to which he may be devoted. Even so does the study of the seven modes of tension reveal cosmical and planetary law regnant everywhere among the largest and the least of individual — Cycle, Circle, System, Organ, Tissue, Cell and Molecule — wherever process is, actual, known or potential. In fact, until we apprehend that the whole is potentially, typically or analogically present in the least, or that the universe is this whole, whose presentment in departments capable of cognition presents us with the segregate modes of motion, or currents, in analogous, concurrent or competing presence, shall we be able to solve any problem in histology.

Becoming involves a deep and hidden or unseen current, or set of currents, that come from without, and appear within the range of sense.

This last word "sense" involves another realm upon which it depends, and without which it cannot be, viz: the realm of consciousness, the basis of all knowing, or knowledge of being, body and process.

The confluence of consciousness and physics posits individual being or beings.

The primal example of individual being is an ideal body denominated the ATOM.

Confluence of *atoms* produces *molecules*, and aggregations of these constitute what are nominated *granules*. This last is the first and least body capable of making its presence known to the senses, and therefore stands as daysman between the ideal and corporeal domain of bodily presence. Aggregations of granules, in regular order, produce functioning bodies called corpuscles, cells, etc., according to the fancy of him who catalogues the objects under consideration.

I said the strivings of differentiation (gravitation) and indifferentiation (spirit) produced Suns, Systems, Planets and Inhabitants of Planets.

A mode of striving known as affinity (kindred) produces the different forms of molecules, and their modifications in granules, cells, tissues, organs and systems, under the tensions of afflux and efflux of currents of force, that make and unmake these bodies at the behest of type, plan, purpose.

Observation has taught us that "like produces like," and "unlike, diversity," in all the departments of individual and associate body. It also teaches the doctrine of cancellation of one form of body in the advent of another, in every example of production and maintenance of physical or functioning body. So that the débris of one grade of body becomes the food of the next to it, by reason of the differences of tension of force and form in the deficiencies or wants, and the sufficiencies or fullness, of the digestory receptacles of the bodies concerned. This teaches that state of depletion or repletion of body becomes the point of invitation to or repulsion of the currents of force that constitute the disintegrating and the integrating, or the destructive and constructive, processes of killing and chaotifying one body for the support of another — the *force* or *life* of which never dies, the form only dying, or rather changing by transmutation or metamorphosis into a more complicated or less complicated form in accordance to the surrounding influences within the sphere of the currents.

All the molecules, cells, tissues, organs and systems with which we are acquainted are but the channels of, and the results of, modes of motion, and they are mutually transmutable into each other, under the dominion of force, as certainly as that light, heat and electricity are modes or phases of motion — though more subtle, fine and evanescent than the bodies upon which we observe their effects — and are the occasion of the conversion of these forms of motion into each other.

So far as we yet see, by the best aids to vision, tissual elements arise in an apparently amorphous mass of what we now call Protoplasm (or first mould).

That which is called digestion, in the broad sense of feeding, consists in comminuting and solving the food, consisting of organs, tissues, cells and granules, into the amorphous molecular mass named Protoplasm, proteinaceous mass, chaotic mass, blood and pabulum, in which differentiation makes its advent, and does its

work of producing the factors of differential function in Sensory, Motory, Secretory and Psychic examples of function.

These are the phases of confluence of consciousness and physics that lay at the bottom or base, and set up the demand for the varieties of tissues as elaborators of the various functions called for to complete the system of organs to which they belong.

We use these terms with clearness of meaning and propriety of significance, or with ambiguousness of meaning and indefiniteness of understanding, in accordance with the time in which we write or speak, and the stage of our education or evolution of the knowledge of process and body, as displayed in the study of histology as seen by the help of a rapidly advancing microscopy.

In fact the microscope has so extended the domain of sight, and cleared up and amplified the apprehensions of body, that we now prefer to investigate for ourselves rather than to read the accounts of the researches of others, as guides to a knowledge of FUNCTION, which is the objective point of all histological acquirement.

Histos, a web, and *logos*, a discourse, are the etymological primates from which we derive our word Histology.

Some webs are made of homogeneous sheet mass; others are woven of fibrous or thread-like, line-like elements loosely or closely laid together to form the web or sheet.

Matter being indestructible, and Force being persistent, they must be regarded as aspects of a something upon which they depend, which something we may call SUBSTANCE, of which the universe consists — which universe, as a whole, is a plenum, and therefore understandable from the comprehension of any one of its systems within our reach for study.

What we call extremes of size are only so by way of accommodation of phraseology. For the molecule, too small to be seen by the assistance of the highest microscopic amplification, is not an extreme but a mean of expressions of force and form, which mean raises it out of the range of mere atoms, and makes it no longer an elemental but a compound body, endowed with new and complicated affinities by which it may be related in manifold method and mode. On the other hand, the astronomical bodies, territories and spaces have been also denominated extremes only, again, by way of accommodation; for, as our knowledge increases, our ex-

tremes become only the mean of that which is ever ready to be and ever is revealed as but the mean between the known and the about to be known.

So, if we would solve the problem of the universe, we must understand the relations of the parts of systems to each other, and thus become acquainted with the analogies that unfold the laws of the whole. The only way that this can be done by one person is to take examples of systems of short career and small dimensions, and so transparent as to reveal the metamorphoses through which they pass from inception, ripeness and decadence, to disruption and dispersion into the elements whence they came.

Fortunately for us, many examples in the vegetable and animal worlds afford us such opportunity. And we may repeat our observations until the whole range of production, growth, death and dispersion is familiar to us.

This patient watching of the ripening of germs, their impregnation and evolution into adult form and fruiting again, is but the true work of the histologist.

The finest naturalists are to this day quite unable to distinguish between the germs of the various orders of animal forms by microscopical or chemical analysis; but this need not induce us to assert that this can never be done.

Natural philosophers uniformly assert the impossibility of our ever being able to demonstrate the size of the atom. I regard it as hardly safe to longer iterate this saying; for the distance between these small bodies called centers and origins of motion (viz, the atoms) has been proved to be near the two hundred millionth (200,000,000th) of an inch by late discoveries in the wave-lengths of different color-rays.

One of the most important of analogies is one that holds good in all forms of individual body, be it large or small, viz., "room" in which to work, sometimes called atmosphere.

The simplest motion is breathing—afflux and efflux. This lays the foundation of change, and is the initial of function in suns, planets and inhabitants of planets.

The deciduous character of the terræ, floræ and faunæ of planets, and of the tissues of our bodies, are but the truly physiological processes by which the planets and our bodies come to their maturity, so as in turn to enrich the soil of the system to which each belongs,

and thus take part in the completing of higher and ever higher career in the never-ending line of progress of a divinely appointed endowment of power.

As deep of solar fullness calleth unto deep of planetary void, in the vast macrocosm of cosmical tissues, so calleth the atomic, molecular and psychic deeps of sense of deficiency to the deeps of pabulum of proteinaceous seas, and the deep of the sea of knowledge, to be infilled with the influx that satisfies by repletion of tissual, organic and psychic supply.

The blood corpuscles are the seed bodies of the various tissues, and the fluid blood is the food of the elements of the tissues, whereon they are sustained and enabled to do the work of organic and systemic career, as they take the place of the worn-out corpuscles and cells by pushing them to the surfaces to be shed as secretions, excretions or dejections unfit for further systemic use.

The duration or length of systemic career depends upon the condition of the organs that constitute the system.

And the term of continuance of the organs, in working condition, depends upon the supply of the tissues that together constitute the organs; and the renewal of the tissues also depends upon a supply of corpuscles (cells) that together form the filaments, fibers and webs of tissues of the various kinds by what has been called alternation of generation of these elemental bodies.

Thus it is evident that COMMUNION is the basis and formative act of society of all kinds and degrees, by which cosmical, planetary and subordinate systems are formed and maintained.

It will be thought to be "far-fetched," "misty," "cloudy" and "irrelevant" by many, if the attempt be made to name the process by which suns are produced, and to indicate the analogy that is the key to all function, in the result, on a cosmical scale, of the single law of gravitation.

Nevertheless, as heretofore, I take the risk, with only one request as condition, on the part of those who object, viz, that they be logical enough to wait until the statement is made and taken into account, before deciding for or against it.

To get at the analogy at the nearest point to us of the cosmical systems among which this earth holds its course, let us state a certitude as if it were a hypothetical proposition, and we may be the better able to catch the significance of analogies. The moon is

nearing the earth. When it comes in full contact with the earth its mass-motion will be converted into molecular-motion, which will fuse both masses of moon and earth, and disrupt molecular affinities, setting them free to reduce the conjoined mass to a sun.

The function of *sun* is radiation, or giving. The function of planetary *void* is asking to be infilled—(demand).

How many moons the earth has had, and how many times it has been partly or wholly reduced to a state of sun, remains to be read by the records safely laid up in its crust; just as the scars in our bodies reveal the traumatic and functional lesions that have in succession held the dominion of nutrition in our bodies and marred the regularity of the arrangement of the elemental bodies composing the *scar-tissue* that will reduce them to earth-mould again so soon as it (scar-tissue) attains the balance of force in the systemic economy.

As habitable planets are produced by cooling down of suns through atomic satisfactions of *desire*, in the formation of ethers, gases, vapors, waters, colloids and solids; just so do satisfactions of molecular affinities produce the varied tissues whose concurrent gyres supply the organic and systemic functions, whose summations produce psychic or affectional and intellectual function in harmonial expression. And thus the planets become peopled with the various inhabitants in orders, classes, kingdoms, genera, species and varieties, in obedience to intelligent desire resident in elements seeking UNION.

Thus degrees of desire are the measure of the degrees of nearness of elemental bodies that constitutes what is called satisfaction of affinity. Therefore nearness and distance determine the quality of body. Thinnest, softest body is spirit body. Thickest, hardest, densest body is natural body. Therefore body, to be body at all, must have not only some degree of thinness, tenuity, but also of thickness, staticalness, stillness; and we therefore have to invoke force and form as the necessary elements of body, be it largest or least.

The difference, then, of that which occupies the interstellar spaces and our atmosphere is but a difference in degree of tenuity, and not in quality of matter. Hence all systems float in an identical ocean of substance, in which they subsist by degrees of teleo-

logical (distant), medioxumous (middle), and terraqueous (earthy) tensions of desire.

The *absolute* being incomprehensible to the finite mind, we can only deal with *relative* origins and careers of being and process.

MIND, being the exercise of consciousness in seriated perceptions, involves potential and active modes which constitute the seriating, or the beginning and completing, or finishing, of the special putting on and taking off of the tensions that comprise the mental acts.

A perfect analogical understanding of any one of the seven aspects of endowment of the power to *unite*, from gravitation to spirit-power, involves knowledge of the whole domain of histology in the demand and supply of factors of function, in concurrent and divergent careers; which we now proceed to formulate in the order of their occurrence in creative and procreative procession.

Confluence of consciousness and physics produces:

1. Confluent tissue, in nerve-mass, which subsequently differentiates into vesicular and fibrous forms of neural tissue.

2. Limitory tissue, in elastic, non-elastic and mixed forms of fiber.

3. Motory tissue, in voluntary, involuntary and mixed examples of muscles.

4. Secretory tissue (or glands), in lymphatic, conglobate and conglomerate forms. Ending in

5. The production of Statical tissue, in shells, bones and teeth; the last made up of three forms in cement, dentine and enamel, to meet the demand of statical requirement in completest degree in the last, which is composed of prismatic rods or crystals.

The offspring of confluence of atoms are molecules, the offspring of molecules are granules, and confluence of these produces corpuscles and cells, which are the elements of tissues, out of which the statical, limitory, motory, secretory and confluent varieties of tissues are formed, under the guidance of the differential types of tissues in: 1, Bones; 2, Fibrous or connective tissues; 3, Muscles; 4, Glands; and 5, Nerves, as the basis of a *mentory* apparatus which is the highest example of congeries of nerves or confluent tissue at present known. In this refinement of functioning body, automatic and instinctive intelligence becomes conscious intelli-

gence, whereby histology and microscopy, and every other example of differential science becomes possible.

Hunger resides in the needy territories. The location of the *demand*, therefore, must be the seat of function.

Function is effected in the individual elements of the factors of function, which are called corpuscles or cells, according to our wont, habit, or school.

Hunger being appeased or satisfied, the demand abates or ceases.

The stomach is the grand *entrepôt* of supplies for the whole system, and therefore for its own individual cellular necessities in its proper tissues, as well as for the rest of the organism, and only contributes its modicum of demand.

The mere filling of the stomach does not annihilate appetite, although it may appease, in a degree, the urgency of the sense of demand by mechanically distending the stomach, thereby forcing the blood-plasm within the intercellular territories more compactly against the needy bodies, thus favoring the appropriation of pabulum before out of the reach of the sphere of cell influence.

Upon the *intelligence*, then, of the cells do we find the satisfaction of hunger to depend, as certainly as that the formation of crystals depends upon chemical equivalency; which is but an example of *atomic intelligence* that knows when it is satisfied — saturated!

Crystallization, cellulation and corpusculation are the differential modes of absorption of radiance of sun-presence, and have their differential termini in the mineral, vegetable and animal kingdoms; all three of which are represented in the human system.

As protoplasm is, in first form, sea-foam — *schleim*, as the Germans have it — it will be well for us to inquire the origin of slime of the sea — sea-foam — meerschaum.

Bubbles of the sea are the results of five modes of motion or tension, viz: centripetal, centrifugal, orbital and revolving motions, and the absorption of sun-radiance.

Centripetal motion is solar attraction.

Centrifugal motion is the tending of a moving body to go in a line.

Orbital motion is the resultant of these two; and Diurnal is revolving motion, or rotation on axis.

Sea-foam arises out of the conflicts of the confluence of these currents of motion, in analogous, concurrent and competing presence at the junction of the atmosphere and the sea, or air and water. Protoplasm, or sea-foam, takes its origin here, and is the basis of all tissue of rock, plant and animal. All belonging to rock or mineral is given to the domain of crystalosophy; that belonging to plants, to cellosophy, and that belonging to animal is remanded to the domain of corpusculosophy, which holds the values of the preceding two other forms of typal dominion. Therefore, in treating of corpusculation, cellulation and crystallization are understood, as possible change of the dominion, as well as that of solution and reduction to protoplasm again.

CELLULATION: I have chosen this term as one least liable to the objections of novices who deem themselves able to assume the role of the expert. Investigators who are afraid of con-se-quences, or are restive under con-vic-tion are not yet mature philosophers.

In using the term cell, to stand primarily for the least body capable of exercising vegetable or animal function, we avoid the conflicts coming out of the study of its origin, in this place, and shall have less cause for limping if we do not forget ourselves and allow our minds to wander from the line of alternations in the onward career of these primates of tissues, in their joint work of producing and maintaining organs and systems.

The differential function of cell is a complication of reception, transmission and absorption of force. This is the work of cell proper. And, as all forms of work wear the worker, (I will not say waste the worker, for this only occurs in doing needless work,) the worker must be renewed or exchanged at each effort, so that career or continuity of work may be secured.

How may we determine cell career? I know of no other way to do this so satisfactorily as to watch the development of the various cells and products of cells in plants and animals as they do the work of their careers in the appropriation of pabulum, working and twisting into tissues, and successively crowding their predecessors to the surfaces of organs, to be shed when no longer fit to constitute any part of an organ.

SECRETION and EXCRETION are examples of moulting of the elemental primates of tissues.

In the example of secretions, the peripheral cells are shed, in

diffluent mass by solving entirely, and bodily, by solution of their points of attachment on all sides. When the shed corpuscles, solved, partly solved, and entire, are to serve other than lubricant uses, they constitute a *secretion;* when in excess, or effete, they constitute what is called *excretions*—both secretion and excretion being the example of end of career of corpuscles and cells.

After this succinct nomination and tracing of career of tissual elements from the first appearance of blood corpuscles to its exit in shed epithelium, it will be well to study the following tabulated series of modes of motion and metamorphoses of bodies and processes before applying ourselves to the grand retrospect, introspect and prospect that completes these mere headings of Histology and Microscopy.

VII. Spirit Power.	Glacial and Recent. (Cenozoic.)	Seeding Plants. (Dicotyledones.)	Spiritual Sense.	Intuition.	Spiritual Love. (Love of God and Heaven.)
VI. Vital Force.	Tertiary. (Mammals.)	Fruiting Plants. (Exogens.)	Binocular Sight. (Mental Sight, Reason.)	Reason.	Universal Love.
V. Chemism.	New Red Sandstone. (Lias, Wealdon, etc.)	Flowering Plants. (Monocotyledones.) (Endogens.)	Smell.	Reflection.	Filial Love.
IV. Electrism.	Carboniferous	Leaf Plants. (Ferns, spores on leaves.)	Hearing.	Imagination.	Fraternal Love.
III. Light.	Lower Fossiliferous. (Silurian, Cambrian, etc.)	Tracheal Plants. (Branches.)	Monocular Sight.	Memory.	Parental Love.
II. Levitation. (Apartness.) (Expansion.) (Heat.)	Stratified. (Azoic.)	Duct Plants. (Trunk.)	Taste.	Conception.	Conjugal Love.
I. Gravitation. (Togetherness.) (Contraction.) (Cold.)	Igneous. (Amorphous.)	Cell Plants. (Root.)	Touch.	Perception.	Self Love.
Motism. (Modes of Motion.)	Mineralism. (Attraction and Repulsion.)	Vegetism. (Botany.)	Animism. (Animality.)	Mentism. (Intellectual Faculties.)	Emotism. (Affectional.)
VII.	Pneumatogeny. (Emotism.) (Spirits.)				
VI.	Psychogeny. (Mentism.) (Rational Natures.)				
V.	Biogeny. (Curvilinear.) (Vegetism and Animism.)				
IV.	Cosmogeny. (Rectangular.) (Mineralism.)				
III.	Morphogeny. (Annulated.) (Offspring.)				
II.	Pantogeny. (Motism—b.) (Pater.)				
I.	Substance. (Motism—a.) (Mater.)				

GRAND RETROSPECT, INTROSPECT AND PROSPECT OF BEING, BODY, AND PROCESS.

When the *desire* to have associates went forth from the divine counsel in the heavens, and was expressed in the recorded "Let us make man," the foundations of *society* were firmly laid in the very *inmost nature of the creature* that was there and then pronounced "very good." If good then, and *very good* at that, where is the door or even hint of point of entrance for anything but good?

Absolute or abstract good is incomprehensible, therefore out of the question now. That which supplies a demand, fills a need, is the only good that can by possibility be so called. Therefore, that which is good to the needy, and satisfactory to his estimation, is indifferent or repulsive to another who is full and lacking nothing of which his sense takes cognizance.

To walk "together" we must be "agreed" (*i. e.*) in like or similar states and conditions of necessities in deficiency and sufficiency.

All those who deem themselves their own keepers, and able to take yokes upon their necks that neither they nor their fathers were able to bear, have quite forgotten to ask to be led.

Under a sense of the truth of the Scripture that saith, "It is not in man that walketh to direct his steps," our helplessness is ever before us, and in our deepest consciousness we are sure that desire is before will (volition), and spontaneity before calculation.

Obedience that is not instant and spontaneous is but second rate at best, and brings but partial sense of satisfaction to the soul — the plane of the sense of need, or appetite.

Those who "serve" the Divine from a "sense" of duty only blasphemously give remnants of their affections, and are trying (Simon-like) to buy their way to heaven. All such have but embryonic ideas of heaven, forgetting the saying, "the kingdom of God is within you."

Without opposites we have no differential, sharp apprehensions of state or place. Therefore both hell and heaven are involved in what is called happiness. A proper use of hell converts it into heaven, and an improper use of heaven transmutes it into hell.

Until serial order of the development of body and mind be formulated and taught, shall we ever come to our mental and moral

majority, in which we are a Law (Lord), unto ourselves in which our spontaneities ever concur with the behests of the Law (Lord).

"Are there few that be saved?" Verily, few indeed attain to mental and moral *childhood* even, at first efforts at evolution of the complete being.

Childhood in the growth of the body is reckoned from the first to the seventh year, youth from the seventh to the fourteenth year, and adolescence from the fourteenth to the twenty-first year.

The moral and religious life has also a serial order of correspondence with this formula. But where are the living examples of the youth and adolescence of these categories? Echo answers, where?

In natural history the mineral kingdom has been regarded as non-living. The straight lines of this kingdom, and the possible forms of body producible by their intersections and conjunctions, are but statical forms devoid of active motion, therefore called dead-forms.

All morals and religions based upon "authority" (external domination) are but the mineralistic analogues of morals and religion, only useful as base or sub-stratum upon which to erect the *Paternity* and *Immanuelism* for the establishment of which they were produced, as stages in the growth of æsthetic society among men.

The "lording it over God's heritage" in religious circles, governmental bodies, schools and scientific societies, is fast falling into the mere stages and periods of geological record of past dominations of forces now canceled and carried into higher fields and broader realms of usefulness; although the incumbents of popedoms, priesthoods, and professorial chairs take little cognizance of the departure of their energies.

If, then, "the fine gold has become dim, and the beautiful garments moth-eaten," where are we to look for safety? Evidently not in tarrying where we are, nor in going backward; but in a ready acceptance of the beckonings of the heavens that hold out kindly hands to charm us out of the necessary hells of development into the embrace of higher, purer, diviner degrees of acquiescence in the Love and Wisdom that energizes and pacifies—"*satisfies* every living thing."

Not in conservatism, not in retrogression, not in head-religion and formulæ, however fascinating to the senses, shall we find our

account, but in ready obedience even unto death, with the ardent exclamation of, "As it is written in the volume of thy book, lo! I come to do thy will, O God!" And thus, without hesitation, and with the sweet ecstacy of divine abandonment, rush to the fulfillment of every requirement of Light and Life, of Law and Love, reckless of results by the very ardor begotten of obedience, and, dancing on the foam of the breaking crest of the advance-wave of real progress, catch and appropriate the divine afflatus of PERPETUAL ADOLESCENCE — the birthright and inheritance of the sons and daughters of the Almighty!

REPORT OF THE COMMITTEE

ON

DENTAL EDUCATION.

BY W. H. MORGAN, CHAIRMAN.

LOOKING to the future of our profession, no single subject looms up with such significance or such transcendent importance as that referred to this Committee. Upon the plan marked out and followed by those of our profession who are now leaders in this matter of Dental Education depends the future status of the profession; not only its status in attainments, but its position and influence among the learned and cultivated of this and all other civilized countries. And in this status every member of the profession must share, to some extent, whether it is his will to do so or not.

With this view, do we realize, both as individuals and as an Association, our responsibility? Have we been sufficiently broad in our views and efforts upon this subject, or is it not lamentably true that we have been narrow and practical, demanding of those seeking admission into our ranks a very superficial knowledge of science in general, and only a respectable moiety of manipulative ability? Such, we affirm, is the truth.

How shall we remedy this evil?

A professional gentleman who recently visited us, from abroad, with the view of examining our system or mode of dental education, seemed to be impressed with the idea that we kept too much aloof from the medical profession. From his standpoint this is true. He perhaps did not know that this was not of our seeking, and that we had been driven, by the ungenerous course of the medical profession in America, into this relation; that we have been forced to organize schools and colleges to teach what it was their duty to impart.

Dentistry is a specialty of Medicine, and should be taught as such. That it is a specialty of Medicine is, we believe, the highest claim that has ever been made for it. If this claim is founded upon truth, what is the legitimate inference as to how a knowledge of it should be acquired? Surely that it should be taught and learned in connection with a Medical College, as are other specialties of Medicine. Men should be qualified for the practice of Dentistry as is the surgeon, aurist or oculist — upon the broad basis of a general knowledge of Medicine. It may be said that our colleges and universities are not prepared to teach our specialty. So much the worse for them; so much greater the discredit to our institutions. Let them prepare themselves for this duty, and meet the solemn demands of humanity. Let a department of Dentistry be added to so many of our universities as will meet the demand, and then let degrees be conferred upon general merit rather than upon special attainments. Let us see, in our annual announcements, no such word as "optional" after Anatomy — but let all our institutions which propose to qualify men for the practice of Dentistry clearly set forth the idea that it is a specialty of Medicine, and must be based upon a thorough knowledge of anatomy and physiology; that these, with other collateral sciences, constitute the foundation upon which Dentistry as well as Medicine must be practiced; otherwise it is the merest charlatanism. It will not do to say that in our medical colleges an improper direction or application is often given to the truth of science — a general and not a special application. We tell you that the student who is incapable of applying general principles to his specialty is unfit to be a dentist, unworthy of a degree, and should be rejected for want of capacity.

We would therefore recommend that, whenever practicable, our universities should have a Dental Department. That the course in histology, anatomy, physiology, etc., should be as long and as thorough as is required of any class of students, before graduation; and that the final examination should correspond with such teaching. This is the point where we think the great evil of superficial attainment begins with dentists.

The writer of this short and imperfect article has held substantially the above views for more than a quarter of a century, and over twenty years ago sought most earnestly to ingraft them on at least one of the then prosperous universities of his adopted State.

ADDITIONAL REPORT

ON

DENTAL EDUCATION.

BY E. J. WAYE, A MEMBER OF THE COMMITTEE.

UPON Dental Education, strictly speaking, I have no report to offer. My subject is one, however, which it is believed may be made to exert upon it an influence so salutary as to commend it to careful consideration. I refer to laws regulating practice and fixing the standard of *Dental Education.*

Two years ago, Dr. C. E. Francis, in a report read before you, made use of the following expressive language:

"So long as a host of illiterate characters or bungling empirics drag heavily at our skirts, hampering and tinkering in a manner as discreditable to the profession as damaging to their victimized patients, so long must we, as a body, expect to share the odium that must naturally fall upon their heads.

"We think a strong effort should be made to rid the profession of this incubus—this dead, worse than useless weight."

"We hope the time is not far distant when every State in the Union will secure safety to its citizens, by enacting a rigid Dental Law, requiring every practicing dentist to show evidence of his ability and fitness to practice dentistry upon sound principles, combined with proper manipulative skill."

These words express the feeling of most of the best men in the profession, I suppose, both as to the existing evil and its remedy; I need not, therefore, enlarge upon what is so generally understood—the abuses of dental practice, and the necessity of reform. As for the remedy, few, I presume, will differ from Dr. Francis in his prescription of a "rigid Dental Law."

Assuming, then, that legislation is the best mode of action, we come to consider what the law should be which will best subserve the interest of both the community and the Dentist.

I conceive that any law which requires of the Dentist a certain amount of education, which he does not already possess, must necessarily be prospective in its operation; that is to say, that time to acquire what is not already learned must be allowed. This is equity; and unless we desire to thrust out of the profession a class of men who in many essentials are among the best in it, such provisions must be made. It is not always the men who have received a collegiate education, and a diploma, who are in reality the most successful dentists, or the most worthy and high-minded men.

Many who know *very* much less than they should of anatomy, physiology or pathology, are in all the practical operations of the office and laboratory, quite the superiors of some who in the extent and thoroughness of theoretical knowledge far surpass them. These studied in the dear but reliable school of experience and observation, perhaps the only one open to them at the time; and though their knowledge is circumscribed, it is both practical and thorough, and forms an excellent foundation, whereon to build a superstructure. There are many such in every State, and they should be made to understand that law is not designed to drive them from the profession, but to elevate and protect them in it.

The Dental Law of Ohio, as originally enacted, was, in most respects, perhaps as well adapted to effect the desired reform as any yet devised. Its provisions were briefly these: a board of examiners chosen from and by the State Dental Society, with power to grant certificates to such as passed a satisfactory examination, and to refuse all others. Such certificate or a diploma from some Dental College of respectability, making the holder eligible to practice in Ohio. All others were prohibited under penalty of a fine of not less than fifty nor more than two hundred dollars for each offense.

Four years were granted wherein to prepare for such examination, during which time all were allowed to practice unmolested, and none were obliged to appear before the Board until the expiration of the allotted time.

Herein, it is believed, was the grand mistake which rendered the law during the whole four years practically inoperative, and which resulted, at the end of that time, in an amendment by which its influence for good was seriously impaired, though not rendered wholly nugatory.

This amendment makes five years' practice equivalent to a certificate from the Board, or a diploma from a Dental College.

As amended, it is unfair in its operation, requiring of the young man entering the profession, a thorough course of office study and tutelage, two full courses of lectures, and a diploma from a Dental College of good standing; while it permits any man to remain in the profession, who for five years previous to its passage had been in actual practice, though each day of that period he had been an empiric, a fraud, and an injury to the community.

Thus the law became purely preventive, and not truly equitable. Now, suppose that provision of the law to be modified in this manner: grant three years wherein to acquire the knowledge requisite for a certificate; but bring all before the Board at once.

Where men fail, (and many will,) make it the duty of the Board to designate wherein, granting such time as in its judgment seems necessary — say one year — and permitting them to practice in the interim. That period expired, let them be again examined. If they have made progress, but are still below the standard, encourage and grant further time. Continue this for the prescribed period under the law, and how many, think you, who deserve to remain in the profession, would be found outside?

Under this provision the board of examiners becomes also a board of educators, and they should be composed of men who *are*, or, at least, are competent to be such. Conducted in this manner, the examination is robbed of half its terrors. It is no longer a relentless Inquisition, propounding perplexing questions upon abstruse subjects, whereof the confused applicant, having no previous knowledge, might have no means of finding the required answers, failure in which subjected him to an ignominious expulsion from practice; thus reversing college precedent (study and lectures first, examination afterward), which is both unjust and unreasonable.

Any law, however mild, which will remedy the evil, must drive out of the profession many who now thrive within it. This class will be the law's most virulent enemies. Is it not important, then,

that the law be so framed that the influence and co-operation of the really worthy may be secured in its favor? Either this or some kindred measure must be adopted, or a certain amount of experience in practice be accepted in its stead; and no amount of ignorant and reckless practice ought of itself to entitle a man to remain in the profession, or be accepted in lieu of knowledge.

We must have guaranty of reform; and reformation implies study, and study requires time. Gentlemen, if a Dental Law be a necessity, then, to accomplish the good intended, it must be so framed that its execution wrongs no man, but rather confers upon all, both community and the Dentist, permanent good.

Such an enactment, to be most effective, should not be the law of a single State. Uniformity in this instance would be an increase of power. As in Dental Ethics, until this Association elaborated and published its celebrated code, now almost universally adopted throughout the Union, nothing definite and pronounced of good resulted, though nearly every society held one of some kind.

So, it seems to me, it may prove as to a Dental Law; and it is respectfully submitted whether, on the part of the American Dental Association, (the highest authority in its specialty in the land,) it were not a wise policy to devise such a law as in its wisdom it deems will best subserve the interest of both the profession and the people; to the end that being adopted by every State it may secure that uniformity of law and unity of action which is so powerful an element of success.

REPORT OF THE COMMITTEE

ON

DENTAL LITERATURE.

BY GEO. H. CUSHING, CHAIRMAN.

SOME months ago arrangements were perfected between the members of this Committee, whereby it was expected that a full and comprehensive report would at this time have been presented. But the member who was to have reported upon new books, having subsequently decided upon a visit abroad for the benefit of his health, felt compelled to decline to serve, and the duty consequently fell upon your Chairman. This change was made so recently that it was impossible for this branch of your Committee to give sufficient time to the work, which was needed to enable them to properly fulfill their duty; so that, except so far as the periodical literature is concerned, this report cannot pretend to be sufficiently full or comprehensive. The endeavor will be made, however, to glance over the field, and at least not to do injustice to such works as may be here considered.

The period of time over which this report should extend — from 1871 to the present — is a very marked one in the history of the literature of our profession. During this time a greater number of works have been published probably than in any preceding ten years, and works of a much more valuable and scientific character. Thus we have the second edition of "Tomes' Dental Surgery;" the second edition of "Garretson's Oral Surgery;" "The Pathology of the Teeth," by Prof. Wedl; "Dental Caries and its Causes," by Drs. Leber and Rottenstein, and "Treatment and Prevention of Decay of Teeth," by Dr. R. Arthur.

"Tomes' Dental Surgery, second edition, by John Tomes, F.

R. S., and Charles S. Tomes, M. A."—This volume, in its revision and enlargement, has for its author, it is presumed, only Mr. Charles S. Tomes.

In the preface to the second edition we are informed that "though large additions to the text have been made, yet the bulk of the volume has been kept within convenient limits by a slight reduction in the size of the print. That those portions of the book which are devoted to the description of neuralgia, dentigerous cysts, odontomes, secondary affections resulting from the irritation set up by dental disease, as well as many other shorter sections, are entirely new; and nearly sixty fresh illustrations have been added. The description of dental caries, with the exception of some slight additions and alterations, remains much the same as in the first edition; but a fuller discussion of the whole subject has been added, in the form of an appendix, in which a summary of the conclusions to be drawn from recent investigations will be found."

It is needless to refer to the general character of this work, which in its first edition occupied perhaps the highest place in our literature; and in commenting upon the second edition your Committee would state, that they have looked through the book carefully, and have read, with greater care, the sections which are entirely new. Copious additions are made throughout the work to the original, bringing it down to the present time, with a record of the best and most scientific theories and practices yet produced. The section on Neuralgia is a very valuable addition to the work, and presents the subject in a fuller and clearer manner perhaps than any other publication has heretofore done. In the discussion of the causes of neuralgia of the fifth pair of nerves it is clearly established that diseased teeth are by far the most frequent, even in a large majority of those cases which, by the generality of writers on this subject, are referred to other causes. Our attention, as practicing dentists, is especially challenged by this chapter, by reason of its direct bearing upon our daily practice. The chapters upon dentigerous cysts, odontomes and secondary affections resulting from the irritation set up by dental disease, are equally well written, and add largely to the value and interest of the work. The appendix is a very excellent *résumé* of the more recent investigations touching the pathology and etiology of dental

caries. The conclusions of the author, drawn from these, is thus summarized: "The following conclusions seem to be most nearly in accordance with the preceding facts, viz.: That caries is an effect of external causes, in which so-called 'vital' forces play no part; that it is due to the solvent action of acids which have been generated by fermentation going on in the mouth, the buccal mucus, probably, having no small share in the matter; and when once the disintegrating process is established at some congenitally defective point, the accumulation of food and secretions in the cavity will intensify the mischief by furnishing fresh supplies of acid."

It will be observed that the author denies to so-called "vital" force any influence in the matter. Your Committee are of the opinion that some weight might justly be allowed to the theory of a greater or less power of resistance to destructive agents as being inherent in the teeth, which might be designated "vital" force, for want of a better term; and they think that many facts might be adduced in support of this theory, quite as strong in their evidence as many of those which led the author to his conclusions.

The new matter which has been added to this work shows the author's familiarity with the best authorities, as well as the evidence of his own careful researches and investigations, and of his thoughtful conclusions.

It is written in a clear and concise style, free from arrogance, giving due credit to other observers and authors, but expressing the convictions of the writer with firmness and confidence, and generally giving logical reasons for such conclusions. Of course it would hardly be possible for a work of this kind to be written that should not be open to criticism, in some minor points at least; and doubtless many American readers would find some faults which would not appear to the English or Continental student. Thus, while in his additions to the department of Operative Dentistry he makes mention of the use of oxychloride of zinc, as a capping for exposed pulps, he evidently does not give this method of treatment the prominent place to which a large number of leading American practitioners would doubtless deem it entitled. And so with regard to new methods of operating, which are considered of great importance and value in this country, he either notices them but briefly or not at all.

Your Committee noticed one thing with regret, which was, a

seeming disinclination to give credit to American inventors or authors. Thus, in speaking of the mallet, he gives the credit to the Americans for bringing this valuable assistant into every-day practice, though not for originating its use, as we are told in a foot-note that "Dr. Hoffman, of Margate, was many years ago in the habit of consolidating the gold by malleting;" while in speaking of the "rubber dam" no reference is made to the originator, or even to the country that gave it birth. This is the more noticeable, because he evidently appreciates the greater importance and value of the rubber dam, as compared with the use of the mallet. It is more noticeable, too, by reason of the evidence of fairness throughout the work, as to giving credit generally where it is due. We have no idea that this was an intentional slight, but it could not fail to attract the attention of the American reader, because of the very great importance which American practitioners place upon the rubber dam.

As a book of reference it is faulty in its arrangement, not being sufficiently divided into chapters, with prominent headings, which would at once inform the reader where to look for the discussion of any particular subject.

Yet notwithstanding these defects, the new edition of Tomes' "Dental Surgery" must hold the place in the highest rank among our text-books of to-day that the original formerly occupied, and should be read by every dental and medical practitioner who would keep himself fully up to the progress of the age.

"A System of Oral Surgery; being a consideration of the Diseases and Surgery of the Mouth, Jaws, and Associate Parts. By Jas. E. Garretson, M. D., D. D. S."—

In the preface to this, the second edition of the work, the author says: "The present volume has been entitled a system; a system the author has exerted himself to make it, step by step, from the elements of the subject — from the first departures from normal life — attempt has been made to follow the various conditions to and through their profoundest complications. During the writing of the book the author has had continuously in mind the recognition of the important fact that in no department of medical science has there existed a hiatus such as that found to-day between General Surgery and Dentistry,— a lacking span, truly, in the bridge of practice. * * * To bridge this gap by supply-

ing the lacking span is the highest ambition, as it has been the almost life-long labor, of the author."

The first half of this work is devoted to a system of "Dental Surgery," in its restricted sense. This has been carefully examined; and though your Committee fail to find that it commends itself to the dental practitioner by any general merit not possessed by other works on this subject, yet it is desired to call attention to a meritorious feature not pertaining to most other works of this nature. Reference is here made to the fullness with which Dr. Jack's method of filling with matrices is treated, and also to the elaborate descriptions and instructions given concerning the application of the rubber dam.

In treating of details of practice of as great importance as these referred to, text-books cannot be too explicit in describing the best methods of manipulating, for the benefit of the student.

Two other points attracted the attention of your Committee. The first is, the announcement of an entirely new theory regarding the development of the teeth, having nothing in common with those heretofore advanced. Of the merits of this theory it is not proposed to offer an opinion, as the author gives no premises upon which he bases his conclusions. The second point is, the prominence which is given to so-called "vital" force, in connection with dental caries.

He says: "That the teeth in their formative state partake of the healthy or unhealthy condition of the system at large, all observers admit. But here, unfortunately, the matter has been left, most practitioners acting on the premise that such impressions are never to be altered. At such a conclusion it is impossible not to express surprise. Who, in his own person, or in the persons of friends, has not remarked the varying conditions of the health of the teeth? Up to the age of sixteen I was myself a martyr to toothache; yet about that period a change occurred, since which time I have had no trouble. Similar instances exist in profusion, and yet the lesson seems unheeded. There is a constitutional treatment for the carious tooth as there is for the carious maxilla, and from a common stand-point are the diseases of both to be viewed. * * * * Integrity of the teeth depends on two general conditions: inherent vital resistive power, and the absence of irritating influences. A tooth may, in its vital relations, be just strong

enough to resist external forces brought to bear against it, if in its construction there is no mechanical imperfection. It may, even with imperfections, be able to resist temporary injurious impressions. The vitality of a tooth can be elevated as the vitality of a lung is increased. The study of the vitality of a tooth, and the study of its adverse influences, is the study of vitality and the expression of irritation anywhere. The treatment of dental caries is both medicinal and operative.

This seems to be a more comprehensive view of the etiology of caries than generally appears in our text-books, and, your Committee think, more nearly approaches the truth regarding the matter. The remainder of the work is devoted to the diseases and surgical treatment of the oral cavity, exclusive of the teeth. This part of the work it has been impossible for your Committee to fairly review, but from what could be learned from early reviews of the book, and from the opinions expressed by leading members of the profession, the conclusion has been reached that although some of the doctrines advanced by the author might meet with severe criticism, the work as a whole will prove valuable as a practical guide in very many cases. Great credit certainly is due to the author for his endeavor to "bridge the gap which has always existed between General Surgery and Dentistry;" and that his efforts have been crowned with partial success, at least, there can be no doubt.

If the present edition fails to fully satisfy the demand, it is to be hoped and presumed that the author will at no very distant day issue another edition which shall supply all that is now wanting.

"The Pathology of the teeth, by Carl Wedl, Professor of Histology in the University of Vienna (translated by W. E. Boardman, M.D., with notes by T. B. Hitchcock, M.D., D.M.D.)"—

The report of this Committee offered at White Sulphur Springs two years ago, made some reference to the above-named work, prior to its translation. In addition to what was then said, your Committee cannot do better than to quote from the notice of the work by Dr. Judd, which appeared in the "Missouri Dental Journal" of November, 1872, as fully expressing the Committee's more matured judgment.

Dr. Judd says: "The work is upon a branch of study which has been too much neglected by the dental profession, and is of too

much importance to be passed over with a hasty notice. As regards its scientific character, it is probably equal to 'Tomes' Dental Surgery,' which has heretofore held a position which, in this respect, had been attained by no other work upon our specialty. One fact must be kept in mind in considering this work: It is not the work of a practical dentist, but he states that it was his endeavor 'invariably to keep in mind the requirements of the dentist,' and in many of the labors and experiments which were necessary for the accomplishment of the work he was assisted by dental practitioners.

"The first part of the work is devoted to anatomy and physiology principally. The histological characteristics of the teeth, gums, and periosteal structures receiving considerable attention, as well as their histogenetic peculiarities. The description of the development of the teeth is not so clear as Waldeyer's, though both quote from Tomes and Marcusen, as well as Kölliker and other authors, and in their principal points do not disagree very widely. Waldeyer, however, is much more prolix and minute in his description of this process than Wedl, though the latter, we think, is sufficiently explicit to serve his special purposes.

"In the second part the irregularities of the teeth receive the first attention. These are treated of under the heads of irregularities in size, number, arrangement, position and structure. Under the latter head, the influence of hereditary syphilis upon the structure of the teeth is discussed at considerable length.

"Inflammation of the pulp, gums, periosteal structures, and caries of the teeth, are treated with much care, and there is abundant evidence of study and investigation throughout the work. The scientific character of the work is in striking contrast with the majority of those which have heretofore appeared upon any subject immediately connected with the specialty of dentistry, whilst it is the only one which has been particularly devoted to the pathology of the teeth.

"The chapter upon the theory of caries, translated by Dr. Koch, of Chicago, we published several months since in this journal, and it can speak for itself as to the views of the author upon this subject. The chapter upon new formations is prolix and exhaustive, giving the most precise and reliable description of the dentinifications and ossifications of the dental pulp which we have met with. Exostoses

of the roots are also treated of with like ability. Cysts of the jaws, or, as they have been called, cystic tumors of the jaws, receive but little attention. They are rather rare, and little is known in relation to their cause, and the treatment of these cystic formations differs considerably among different practitioners. We have seen one clearly marked case in a child of three years.

"In speaking of the 'green deposit,' or green stain found upon the incisors, following the lunated margin of the gums, he says, it 'cannot be washed off in water, nor wiped off, but must be scraped off with a sharp knife, when the enamel will be found bright and intact.' He says, also, 'I have never observed a penetration of the green granular mass into the peripheral enamel layer.'

"This, we imagine, would not accord with the experience of most dental practitioners who have given this subject special attention. The author's explanation of the formation of tartar, which he states 'is formed in greater abundance upon the facial surface of the upper bicuspids and molars,' and which he accounts for by 'the fact that Steno's duct opens directly opposite the second BICUSPID,' will need some revision.

"The chapter upon the neuroses treats at length upon the causes of dental neuralgia; and some theories are propounded which will require more testimony in their favor than has yet been adduced, before they will be generally adopted by the profession — though upon this subject this author is much more philosophical, and we imagine much nearer correct, than Anstie, with his startling hypothesis regarding the atrophies of the spinal nerves. One point deserves special attention: He considers the extraction of teeth as a special exciting cause of neuralgia. Gross has reported several cases where severe neuralgias had their origin in the alveolar process when teeth had been extracted, and which were cured by cutting out the portion of the process where the pain originated. We can easily imagine that nerve fibers may be compressed by the contraction which takes place in cicatricial tissues, but these cases are undoubtedly rare. The author also says that, 'after the amputation of limbs, sensitive nerve-tubes sometimes grow in large numbers from the ends of the divided nerves,' and he thinks an analogous process may take place after the extraction of teeth which might produce a neuralgia. We are aware that neuromata also develop upon the ends of divided nerves, and give rise to neu-

ralgic affections; but the neuralgias arising from all of these causes are undoubtedly much less frequent than those which arise from the irritation produced by fangs and teeth, which are nearly or quite deprived of their vitality, remaining in the gums or in their sockets. Many interesting questions are discussed in this work, and generally with marked ability. It is well worth the attention of the profession, as it is by far the most valuable addition to our dental literature which has appeared for many years."

The annotations of Dr. Hitchcock are very brief, but valuable, and it is to be regretted that he did not make more of them.

"Dental Caries, and its Causes; an investigation into the influence of fungi in the destruction of the teeth. By Drs. Leber and Rottenstein (translated by Thomas H. Chandler, D.M.D.)"—.

This is a work devoted to the endeavor to establish the fact of the prominent influence which Leptothrix Buccalis exerts in the destruction of the teeth in so-called caries. The work is very admirably written, and gives, undoubtedly, the results of an extended series of observations, but fails to establish anything more than the fact that leptothrix are invariably found in connection with carious dentine, and occupying the dentinal tubuli. The demonstration of its active influence in the process is wanting, but the results of these extended observations, so fairly stated as they seem to be, furnish much food for thought, and doubtless will stimulate other observers in this direction, until the question may, perhaps, ere long be definitely settled.

This work seems to attribute the so-called "green stain" to the leptothrix; but as the authors say they have made an examination of but one case of that character, their observations need to be largely extended, and corroborated by those of other observers, before we can accept this theory.

The descriptions of the appearance of the various changes in the tooth substance during the progress of caries is very clear, though not, perhaps, as good as Wedl's. The latter author, though acknowledging the presence of leptothrix, does not accord to it that influence which Leber and Rottenstein do. The illustrations in this work are very beautiful, furnishing some of the finest specimens of lithography to be found anywhere. This book, though failing to demonstrate fully its claim, must yet be held as a most

valuable contribution to our literature, and its views must command the respectful consideration of explorers in this field.

"Treatment and Prevention of Decay of the Teeth. A practical and popular treatise, by Robert Arthur, M.D., D.D.S."—

It will be impossible to give to the work bearing the above title, the full consideration which the importance of the subject it treats of really demands, but its chief features will be referred to. The work proposes, for our consideration, an entirely new system of practice, as regards decay of the teeth upon their proximal surfaces.

It looks chiefly to prevention, rather than to cure, and claims, briefly — that all the teeth can be preserved from decay upon their proximal surfaces by the practice of this system.

This method proposes the creation of artificial spaces between all the teeth, commencing with the eruption of the first permanent molars; which spaces, it is claimed, may be rendered permanent by giving them the proper shapes. Thus, for the incisors, the spaces are to be V-shaped, with the broadest end of the opening toward the lingual aspect; while for the bicuspids and molars they are to be shaped so that there will be a broad end toward the lingual aspect, and also a broad end at the grinding surface — constituting what is called the double V, or wedge-shaped space.

It is not proposed to discuss at any length the merits of this proposed system, but it may be briefly stated that there is no doubt that some more efficient means for preserving the teeth than any heretofore practiced, is earnestly desired by the profession, and any suggestions that lead in this direction will be gladly accepted by the profession at large. That Dr. Arthur's views are all sound, no one, perhaps, would at this time affirm, but that his plan is largely based upon philosophical grounds your Committee feel can be established. The testimony concerning the results of this method of treatment must necessarily, at the present time, be very meager, and for any evidence covering an extended period we must rely upon Dr. Arthur himself. Such testimony generally would not have very great weight, but there are some facts concerning his testimony which, perhaps, justify us in giving more than usual credence to the author of a new method, touching its experimental workings.

Dr. Arthur tells us that this system has been the growth of years of study and experiment in this direction, that he has been

practicing thus for the past twenty-five years, and that his experience has justified him in bringing before the public this as a new and improved method. We rarely have new things presented for our consideration in this way — claiming to be backed by any such testimony of experience — and so it must be allowed that Dr. Arthur's evidence challenges our respectful consideration in no ordinary degree.

As a literary or scientific work, the book is full of faults, but of these we do not propose to speak.

It is to be regretted that the work was published just as it was — addressed both to the public and the profession; for while it is very doubtful if it will be productive of any great good in its character of a popular treatise, it is, at the same time, very deficient as a text-book for the practitioner, as to the details of the proposed system.

It is very unfortunate in its tone when it refers to practitioners generally, and to the advantages or otherwise of generally followed modes of practice. The tendency of the work would be to lead the public at large to question the value of the services of any man in the profession except one, which effect was doubtless very far from what the author intended or desired.

Again, the work seems to place but a low estimate upon the qualifications necessary to fit a man for filling teeth quite well (page 208), while your Committee have come to think that the proper treating of even the simplest cavities requires a more than ordinary degree of skill.

Then, too, the author seems to consider that no special ability or skill is requisite in the pursuit of his method. He says (p. 154), "All the requisite operations are certainly within the capacity of dentists of very moderate ability."

Now, if these operations are to be performed successfully, the Committee are of the opinion that they require, on the part of the operator, a degree of skill much more than moderate.

But whatever the faults of the work, it may claim the merit of presenting to us a system which is founded upon seemingly reasonable premises, and it deserves at our hands the most careful consideration.

Mention will here be made of an article which was forwarded to the Committee, in response to their request, which was published

in the journals — the only response, by the way, which that request elicited; though the Committee have been informed, since the writing of this report, that at least two other books pertaining to our specialty have just issued from the press.

"Upon the Teething of Children. By Dr. Adolph Petermann, Frankfort-on-the-Main. An extract from a popular scientific lecture delivered December 14, 1871, in the 'Freien deutschen Hochstifft.'"

The above is the title of a well written article particularly addressed to mothers, and only commands our notice here as suggesting that possibly we have a duty in this same direction, from the observance of which much good might arise.

In concluding this report, your Committee feel that this Association, and the profession generally, have much to congratulate themselves upon, and still more to hope, from the exhibit here made regarding the productions of the past two years. There has been nothing occurring in the history of our profession so conclusively establishing the advancement of our calling toward that place of honor and repute among the professions which we hope and are destined to attain; and we should be stimulated thereby, each in his own sphere, to renewed efforts for the advancement and honor of our chosen calling.

REPORT

ON

DENTAL LITERATURE.

By E. A. BOGUE, of the Committee.

IN making a report on the magazine portion of Dental Literature, we shall endeavor to make such a summary that a more comprehensive idea may be had of this branch of the subject than we have been able elsewhere to obtain.

To begin with, there are 7,839 dentists in the United States, about 2,200 in Canada, and nearly 4,000 in Europe and the larger capitals elsewhere; a sum total of about 14,000, of whom 10,000 live in America. Unhappy Americans!

Among these 14,000 dentists there circulates a great number of periodicals of various degrees of excellence or otherwise. According to the best information we can obtain, 1 of these is in Italian, 2 in German, 1 in French, 1 in Swedish; 3 are published in England, and 4 in America.

Of these 12 prominent journals, 5 are independent of other commercial transactions—"The Vierteljahrsschrift," published in Germany; "The British Journal," "The Odontological Society's Transactions," and the "Monthly Review," published in England, and the "Missouri Journal," published in America—out west; while all the others, so far as known, are primarily maintained for the purpose of advertising some one's merchandise or practice, or school, and would at once be suspended were that object removed. There were certain other journals lately published, but we have to record the suspension during the year of three of these, of which two have been for many years established—"Der Zahnarzt," "The Philadelphia Dental Times," and "The Canada Journal of Dental Science."

On the other hand, there have been at least three new journals established — the "Correspondenz Blatt für Zahnärzte," in Germany, and the "Giornale di Corrispondenza pei Dentiste," for Italy, both published in Berlin, by Messrs. Ash & Sons, and the "Monthly Review of Dental Surgery," published in London. The "Vierteljahrsschrift für Zahnheilkundt," which is now in its thirteenth year, is the organ of the Central Association of German Dentists, and is a quarterly publication; it has assumed the work, and endeavors to fill the place, of "Der Zahnarzt," which was suspended at the end of its twenty-seventh year. This latter was a monthly publication.

The former publisher of "Der Zahnarzt" undertakes the publication of the German quarterly, at his publishing house in Leipsic, while Herr Baume, of Berlin, undertakes the editorial control, thus making it a purely literary venture on the part of the publisher, who is not otherwise interested in dental goods. This gives to Germany one thoroughly independent and high-toned journal which is the organ of an association somewhat like this one, and is sustained by its members.

The other German "Journal of Correspondence," as well as the Italian one of the same name, is published and managed, as before stated, by Messrs. Ash & Sons, of London, through their branch house in Berlin, who have, as a primary object in publishing these journals, the furnishing of a medium for their own advertisements of dental goods to be spread before the profession. The other new journal is published in London, and is an outgrowth of the feeling which is gradually permeating the minds of our Trans-Atlantic brethren, that freer and fuller discussion of matters connected with our specialty is essential to a rapid progress therein.

It will be noticed that the proceedings of the American Dental Association are not included in the list of periodicals, any more than the proceedings of the State societies: yet two of the journals mentioned — the German Quarterly and the Odontological Journal of Great Britain — are the organs and the record of the proceedings, each of a society, and are among the most valuable of the publications which are confined strictly to dental specialties.

To return now to the magazines of our own country — as has been already stated, the Philadelphia Dental Times and Canada Journal have been suspended; there remain to us the Missouri

Journal, The Cosmos, The Register, and the American Journal, as media of communication between the members of the profession.

With regard to the first-mentioned journal, it seems to be independent of all business interests that would overshadow or retard the positive advance in science, and knowledge of all useful kinds in our profession, including the knowledge of how and where to get, on the best possible terms, the materials needed for our work.

So far as the other three journals are concerned, they are apparently published with the design of causing their literary matter to carry the advertisements, which is the essential thing to their respective publishers.

One, at least, of these magazines declines to publish the advertisements of rival firms at any price; hence we are now threatened with the establishment of two more so-called dental journals, which will be published, if at all, primarily in the interest of manufacturers having wares to sell; and therefore cannot be expected, any more than those already established, to take the high professional ground that ought to be occupied by a scientific journal.

It is a noticeable fact that since the days of the old series of "The American Journal of Dental Science," dental literature in this country, as represented by the bulk of magazine articles, has been at a low ebb, many of the men of the highest ability and most extended experience having withdrawn themselves almost completely from contributions to our science through these vehicles.

It is a well-known fact that any dealer in dental goods, publishing a magazine, is liable to lose a customer if he declines to publish an article sent him, no matter how crude, illy constructed, or ungrammatical it may be. If the magazine is published by a college, conducted as most of those institutions now are, the fear of losing a student, or the influence of a former student, would be equally operative in case communications of a similar nature are rejected, and we cannot blame business men for conducting their business operations strictly with an eye to the largest pecuniary returns.

Turning now, for a moment, to the other side of this question, it cannot be denied that much labor and care have been expended to make these magazines worthy of being read, and to enhance their value as literary productions; but in the very nature of the case it has been impossible to produce the best results.

Very many gentlemen, capable of instructing us each in his own special department of study, decline to give their best efforts to any of these ephemeral publications, but furnish articles of sterling merit for the meetings of the various societies which are oftentimes copied far and wide; and it gives us pleasure, in this connection, to step out of our way to notice the published Proceedings of the Illinois and Iowa State Societies, which, within the last two years, have contained as much valuable original matter as, perhaps, all the magazines of this country put together.

The Missouri Journal has not feared to speak out truthfully and plainly in regard to several abuses — notably the hampering of discussion in regard to dental education, and the unfortunate position of our current literature.

It contains, during the year, about twenty articles that might be called scientific, of which nearly all are copied from sources not always accessible to the dentist. A few are original.

A large number of articles that may be called literary — such as descriptions of modes of practice, new instruments and appliances, the proceedings of societies, and the interchange of views, or guesses regarding certain questions that are under discussion — constitute the balance of its table of contents, which, by the way, is not at all well arranged for the student to know at a glance whether a given article is original or copied, or who is the author.

The "Cosmos" contains about ten scientific articles, of which one runs through the entire year; and twenty-three literary articles, all of which are original.

The table of contents of the "Cosmos" is admirably arranged, and one may know immediately whether an article with a given heading is original or copied from some other source, and if the source quoted from could be included, it would be a great assistance.

The "Register" is under its old editorial management, but it is now published by a firm of dealers in dental goods, as is also the "American Journal" of the new series. A few original articles of some value have appeared in these journals during the past year, but most of the more valuable contents of their pages, exclusive of the advertisements, have been copied from other publications.

The new "Monthly Review," of London, contains a large number of original articles, and is about equally divided between

scientific and literary matter. It seems to be thoroughly alive to the best interests of the profession; and while able to furnish a large share of its scientific articles from first hands, it draws freely upon both medical and dental publications in the United Kingdom, upon the Continent, and in America. It takes the highest stand in regard to dental education, and has less heavy gravity, or what might be called the dignity of dullness, than any foreign magazine of which we know.

A noticeable series of articles have been those upon Fletcher's fillings, including the reports of the committee appointed to examine into their merits, and involving inquiries into the whole series of oxychloride of zinc fillings.

The physiological researches of Mr. Tomes may, perhaps, be mentioned as being of great interest, and as showing the bearing of the doctrines of Darwin and Huxley upon the every-day matters of our work-day life.

The "British Journal" has continued the even tenor of its way, containing much that is useful, very much that is on a par with our own journals, and, in fact, with all other journals of our specialty which are published monthly—namely, much diffuseness.

One eminent service it renders each year—it lays before the practitioners and students the examination questions propounded at the College of Surgeons, both for admission and for graduation, so far as it is able; and by this publicity stimulates both teachers and pupils to higher and fresher attainments.

To sum all up, it is the opinion of your Committee that our magazine literature needs two things sadly; independence—the opportunity for free expression regardless of anything but the truth; and recognition by and co-operation with the medical journals already established, in whose columns a few of our number are already making themselves felt, and by so much enhancing the dignity of their profession.

We are of the opinion that a journal published, perhaps, quarterly, and managed by the dentists themselves, as the organ of a society, or of several societies, and published in the interests of the highest and best needs of the profession, would be a power for good, and would draw out a quality of support superior to that now accorded to the journals. Such a magazine could advocate a high standard for graduation to a degree, and not fear the with-

drawal of valuable patronage in case of a comparison between two rival schools; nay, it might advocate the closing up altogether of all but one or two of our schools, and the establishment of a board of examiners from the profession at large, who alone should have the power to grant degrees, and who, by their searching and impartial examinations, should make a degree worth more than the bare money cost of getting it.

DISCUSSIONS.

Dr. MORGAN: I have read the recent work of Dr. Arthur. I regard him as unreliable. For instance, on page 23, he says: "I would here say that I cannot be strictly accurate." Now I aver that no man can be relied upon who is not "strictly accurate." See page 103—he says: "A dentist who is worthy of the name should be able to recognize such cases (such as will not decay during the life of the patient), and to avoid unnecessary and injurious intermeddling with any of the teeth. I hold myself capable of making this discrimination." Who believes this can be true, under all the modifying circumstances of health, age, etc. etc. No man can do this. Again, on page 8, he says: "That the pain usually attending dental operations may be entirely avoided;" and for fear he may be misunderstood, he reiterates, on page 174, "But a very important feature of the method [his method] is that, by its adoption, all painful operations may be avoided." I am sure no one here believes this. His plates or cuts are objectionable and unfair, in that they do not represent any of the classes of teeth most difficult to treat by his method. For illustration, divide the teeth into five classes, beginning with those most perfectly formed, not one of his cuts would represent teeth of the 4th and 5th classes, those with long, large crowns and narrow necks. He says, on page 83, that children's teeth should be examined at *least* once a month, and should be pressed apart with tape to do so. In another place he says once a week. This is simply out of the question, for if a man had a score or so of children under his care, and should so proceed, he would do nothing else but press apart and examine.

On page 17, speaking of the enamel, he says: "These fibers are united by an intermediate substance, and the surface is smooth and polished." Now, we all know it is often rough, grooved, and pitted. This he contradicts before he gets to the bottom of the page. The fact is, the book is self-contradictory from beginning to end.

Dr. ATKINSON: We are not sufficiently advanced to pronounce so dogmatically as has been done in the work just referred to. This work seems to be a benevolent effort to make Tom, Dick, and Harry know the shortest time in which to do the most mischief. The appliances referred to in his book are unfit for use. The large discs that are thin enough require the mouth to be opened too wide. There is not one of them recommended by him but what is mischievous; and his own are execrable. It has been claimed here that Arkansas-stone can be made to reach every part of the tooth. I apprehend that no stiff body can be adapted to the surface at all points. Corundums are better than files.

Dr. THOMAS: Amid the general and wide-spread diffusion of dental science, the time has arrived to direct the public mind to something better than manipulative skill. Patients come into our offices expecting only to receive manipulative skill, and never think of consultation as to the best manner of preventing disease. Some time ago a committee was raised to solicit articles for distribution among the public, and to produce terse articles for the school-readers upon the care of the teeth, proper diet, etc. It seems to me that every patient ought to prize the valuable time we spend in explaining these points to them in the office high enough to pay for it. How many of us get actual fees for such advice? We must make the patients feel that it is valuable; we must guide them in regard to the prevention of disease. If we do this, the demand for manipulative skill will decrease. Let us look into this: I can remember when, a few years ago, I could not see the bearing of many things discussed at these associations; but I began to appreciate their value as my sphere of thought enlarged. We should have pamphlets published; better without any name. Let them be worthy, and I think they will be generally appreciated and acted upon.

Dr. HITCHCOCK: If the profession had journals which were not published in the interests of manufacturers and dealers in

dental goods, so that they could take an unbiased view on any subject, there would be one step gained. It is not State laws to regulate the practice of dentistry which is to advance our standing; it is thorough education. Until we increase in scientific culture, as a profession, we shall fail to receive that recognition which we talk about so much. We cannot get this by standing day after day at the chair; some time must be given to study. If we will not do this ourselves, do let us insist that those who are to follow us shall do it; that they shall acquire the habit of study and observation while they are young.

This cannot be done by attending one course at a dental college. Connected, as I am, with the Harvard school, I feel that I cannot speak without reflecting somewhat its views. I do strongly feel that the schools make a serious mistake, and one which they will feel some day, in allowing students to graduate after attending only one course. They must have had the same experience which we went through for three years. Where one person, who would be a credit to the school as a graduate, applied under the plan of allowing five years' practice to be considered as equivalent to one course of lectures, some eight or ten young men would come forward who had been "in practice" since they commenced to study — three or four years in all. Many, upon learning that five years only were accepted, said, "I will go home and practice another year, then I can get through in one term." Now, this is not only encouraging superficial education, but it is offering a premium upon it — one which can be reckoned in dollars and cents. When dental schools were first established there was perhaps some propriety in this provision, but that was many years ago; and have we been standing still since then?

It is under this provision that nearly all of the "irregularities" in granting degrees have occurred. The better men should take the lead in earnest encouragement of those schools which endeavor to advance the requirements; as a result, not only will others follow them, but all the colleges will feel the influence and receive an impulse which they cannot resist.

If the colleges will take the proper course, we shall soon have a better literature, and it will be better sustained. At present, the only journal we have, which is not controlled by a dental depot, is

the "Missouri Journal," and I am well pleased with its independence, and we ought to encourage it.

Dr. WRIGHT preferred terse articles in papers and pamphlets, for popular education. Referred to the plan, which he stated had originated with the "Missouri Dental Journal," of publishing the biographies and giving the likenesses of prominent dentists, and thought the plan a good one. Hoped to see the officers of the American Dental Association appear in this way.

Dr. STELLWAGEN: I am pleased to see an advancement, every day, in the profession; I am pleased to see that we are not so far behind as some would have us think. All the journals contain very valuable matter. I fear you are too easily dissatisfied, both by your colleges and your journals. But, let me tell you, crimination and recrimination do no good. Let each one determine to do all in his power to promote the interests of his profession. It will be years before we can talk of educating the public. We must educate ourselves — bring ourselves up to a standard of respect among our brethren of other professions. In Philadelphia there is no trouble on this ground; there is no invidious distinction between dentists and medical men. I have seen the highest respect shown to dentists by the first medical men in the country. They place their wives and children in the hands of the dentist, and meet on a level or not at all, thus throwing the entire responsibility upon the specialist. But the time has not yet come for uniting the two professions in one. Until the medical profession views the dentists in their true light we had better separate our journals and separate our schools. The day will come, and I hope to see it soon, when every man will be required to show his medical diploma before he is allowed to matriculate in a dental college. I am waiting patiently, but I am sure it must come.

I wish now to answer a remark in regard to the action of the Quebec Board, referred to in the paper just read. It has been too hasty in its action. It accuses the Philadelphia Dental College, and the Pennsylvania Dental College, of repeatedly violating their published requisitions. On consultation with Prof. Buckingham, I learn that in his school only three men have been received from Canada, but two of whom are living, and they are certainly worthy men. No man can pass through our college unless he is well qualified to do so. Out of the fifty-nine who presented themselves

for graduation last term, one was told that he could not come up for examination, on account of his having been addicted to bacchanalian revelings, and only forty-nine received degrees. We have always endeavored to elevate the profession. We do not ask for students unless they are of the right kind. At our last college commencement party, I was repeatedly taken by the hand and congratulated upon the material on which we had to work. "The profession cannot help advancing with such an elegant set of men coming on" was often remarked.

The dental colleges have accomplished what no other colleges have. One fourth of their students are from Europe. I defy you to show where any medical or scientific college has done this.

In conclusion, let me say that, so far as we know, the charges brought against our school by the Quebec Board, are wrong. I have a copy of a letter written in reply to these charges, which was sent, that I would like to read. [By permission the letter was read.]

Dr. TAFT: I never imagined that this subject was quite so elastic as to be converted into special pleading. Our discussions should not take this course, nor should they, on the other hand, enter into condemnation of enterprises in the manner which has characterized the present discussion. While it is worth while to examine our literature as to its ability, it does not seem proper to enter into such a tirade of condemnation. It is very easy to criticise. Certainly the journals fall very far below what we would have them to be; but have they the proper support of the profession? As to the articles contained in the journals, one may be of very great value to one man, though not to another. Let us bid them God-speed. Because all the articles are not of the highest order, it does not follow that they will not be of service to anybody. In regard to publishing biographies, the "American Journal" began that years ago. It is by no means a new thing. In reference to the subsidizing of the journals to commercial interests, this must be taken with a few grains of allowance. I insist upon it that this wholesale denunciation is out of place. Let us walk shoulder to shoulder, man to man. All the journals are doing all they can. The "Dental Cosmos" is a very valuable journal. The "Dental Register" is doing all in its power to advance the interests of the profession. It is true they are published by men who

sell dental goods; but that has nothing to do with the articles which appear in them. I do not think our journals should be throttled in this manner. In regard to Dr. Arthur's work, I think Dr. Morgan's criticism a just one, and also Dr. Atkinson's. In regard to the doctrines taught, I think that, so far as a practice is predicated on these principles, it will be wrong. Books should be very careful in what they say, as they are to go before students.

Dr. HERRIOTT thought the journals were not supported by the profession as they ought to be. He said that he had recommended the employment of a reporter by all the societies, and the sending of the proceedings to the journals. They would be of great benefit to those who could not attend.

Dr. TAFT said that it was an up-and-down business with the editor. At one time a man would come in and say, "What in the world did you publish such an article for?" And just after, another would come to thank him for it, and say it was the best thing he had ever seen.

Dr. JUDD said that he had nothing to say, one way or the other, on the question, but would simply remark that he regarded this discussion as an outcrop of public opinion. The same thing had occurred in medical circles twenty years ago, and it wrought a good influence on medical literature. He had tried to find something in the medical journals to criticise, but had failed. It was not so with the dental journals. He did not believe they could have a first-class literature until it was perfectly independent. It is not so much so now as the literature of the medical profession.

Dr. WRIGHT said he had no disposition to go back on the "Register" — he couldn't do without it.

REPORT

ON

MECHANICAL DENTISTRY.

By W. M. HERRIOTT, of the Committee.

I BELIEVE that the object of a standing committee upon Mechanical Dentistry, in an organization of the character of the American Dental Association, should be to advance the interests of the profession by discharging the duties indicated by the name given to the committee.

To fully realize the great importance of this branch of our profession we must comprehend the magnitude of the necessities of those who are looking to us for relief from their embarrassed condition, caused by the loss of the teeth. I, one year ago, asserted the fact that more money was paid by the people of America for artificial dentures than was paid for filling teeth; this was discredited by some, but is acknowledged by all who take the trouble to learn the facts.

Now, as this is true, should this very important part of the field which we have undertaken to cultivate in the interests of humanity be neglected? That it has been by the leading members of Dental Societies no one will question, and it is also evident that our journals have not received that support by us that they needed to assist them in carrying that power with them, as teachers, that they would desire as to this half of our profession.

It was asserted by a member of this Association, at its meeting in 1864 — one who stands high as a journalist, and a professor in one of our best dental schools — that too much importance was attached to Mechanical Dentistry, and too little to preserving natural teeth. However true this may have been then, it is not true now.

Bases for artificial teeth long in use, I will not stop to refer to. To those of more recent date only will I give attention. Among these we find an alloy of tin and bismuth, which, if united in the oxides in the proper proportions, so as to make a chemical compound — not a mechanical mixture as when united in a metallic state — gives us that which is as pure as a single metal, and, when properly constructed, gives us an artificial denture, strong, pure in the mouth, and quite comfortable to the patient when weight is not an objection. Later, we have had offered for our uses celluloid — a composition of strong hemp fiber, gum camphor and coloring matter, nothing more. The inconveniences to the operator in using this base have been overcome by the manufacturers, who are giving us plates which become softer at the degree of heat to which we can subject them, which obviates the danger of breaking teeth and models. A denture, when this base is used, and care is taken to grind the blocks so that they will be nicely joined together, has the appearance of continuous gum or porcelain work. Celluloid being quite strong, a plate of it can be made thinner than rubber; and this, with its being a better conductor of heat, allows the mouth to experience the thermal changes which appear to be necessary to keep it in its normal condition.

Quite recently gutta-percha has made its appearance in a vulcanizable form, and has the advantage over other vulcanites, of being more easily flasked, has no unpleasant odor, and does not appear in the joints.

The elective course in the selection of that material which would be best suited to each particular case, is not enough practiced by many operators. We should study well all the requirements of our patients, and select as a base that which would be best suited to his or her mouth, as each form of base used has qualities differing from the others in as great varieties as we find of materials used. The dentist who would by his practice say that all mouths were alike, and would insert teeth upon rubber, or even gold, for every case, and say that that was the best way to operate, is as much to be condemned or pitied as the physician who would call all diseases fever, and would prescribe calomel alone, and would insist upon that as the best, the surest mode of practice.

The teeth, the most important part of an artificial denture, we

will next consider; most important, because their form and strength give the beauty and efficiency to the entire structure. And as the manufacture of teeth has gone from the dentist into the hands of those who make, but do not mount teeth, that advancement has not been made that might have been; still, it is with great pleasure we notice the gradual improvements made by the truly skilled manufacturer, the one who puts brains with money into his business, whose taste and time are expended in developing and improving upon suggestions thrown out by the dentist, who is truly a liberal artist. This one we should support in all ways within our power, for he is with us a pioneer in this great profession.

The only artificial teeth we have found practical are those made by moulding porcelain upon pins of platinum; but we have found great trouble from the pins drawing from the porcelain by the retractive forces to which the teeth are subjected; but this weakness has been overcome perfectly by the use of the up-set foot-shaped pin found in the teeth now manufactured by S. S. White.

The practice of so many, of making so called temporary teeth, is bad in practice. A set of teeth, whether they be a first or second set for the same patient, should be called a set of teeth, and should be charged for in proportion to time and skill necessary for their construction. Also, let me, in conclusion, say that all operations of the dentist should be charged for in such a way that he will be fully remunerated for his success in supplying the wants of his patients, whether he fill a tooth or make a set of artificial teeth; he should not make his fee in proportion to the number of teeth inserted, but in accordance with the time and skill necessary to make a complete operation; and it will only be by this mode of practice being adopted that we will hold Mechanical Dentistry up to a proper standard, and prevent it from becoming a trade to be practiced by inefficient operators. Does not humanity demand something better from us?

REPORT

ON

MECHANICAL DENTISTRY.

By W. H. EAMES, of the Committee.

As one of the members of your Committee on "Mechanical Dentistry," I beg leave to offer a few thoughts and suggestions on the present and future status of this branch of dental art. Before entering upon the subject to which I desire specially to call your attention, I will pause to notice a material (not mentioned in the report just read) which is now being introduced in a new form, and with a new method of manipulation. I refer to Dr. McClelland's "Rose Pearl Base." Improvements have been made in the manufacture and mode of working this material, which it is claimed entirely overcomes the objections heretofore urged against it. It is now moulded into plates, similar in form and appearance to the celluloid and coralline bases.

To construct a plate, the teeth are arranged in substantially the same manner as for any of the plastic bases. Lead or tin is used for the base or trial-plate, covering only the palatine portion of the model, wax being used for the remaining portions. When the teeth are arranged on the base plate it is placed upon a metallic model, the wax is then removed from the outside of the teeth and plaster substituted; when this is set, the wax upon the inner side is removed and plaster substituted in like manner. When hard, the plaster is carved the same as wax would be for a similar case on rubber. A sectional metallic mould is then obtained of the entire case; plaster and base plate are removed and the teeth and moulded plate placed in this mould, heated to 280° Fahr. in a bath of spermaceti, when it is pressed into the required form.

The time and labor necessary for constructing a plate of this base is about the same as required for rubber. Plain teeth alone are used for this work. The material approaches so nearly the color of the natural gum that the use of gum teeth is seldom necessary. Of the durability of this material I cannot speak. Judging from the specimens I have seen and tried, I am favorably impressed with it.

An improvement has been made in the form of teeth adapted for this and rubber work, by which the liability of the inner cusps of bicuspids and molars to break down, when ground down near the shoulder, is overcome. It consists of a fillet placed in the angle of the shoulder formed for the reception of the material, which supports the cusp. The lingual surface of the teeth has been changed so that the material of the base does not come down upon them as far as with the old forms.

Of the present status of mechanical dentistry, I regret to say that while rapid strides in advance have been making in the departments of surgical and operative dentistry, the so-called mechanical branch has been retrograding and losing caste, notwithstanding the urgent appeals which have been made in its behalf from year to year, by your Committee and others, who, recognizing its importance, felt that it was becoming a reproach.

Many of you, gentlemen, as well as myself, have noticed the gradual change which has taken place in the relative importance and standing of this and the operative and surgical departments. The time has been, when the men who stood highest in the profession, and who were recognized as the best operators, were among the best plate workmen.

Good mechanical dentists (an appropriate term) were as common then as good operators and scientific dentists are to-day. The standing and ability of the dentist then was as dependent on his ability to construct a good set of artificial teeth, as it now is on his scientific attainments and ability to save the natural ones.

Then, mechanical geniuses were selected as fit subjects to make dentists of; now, intellect is looked upon as an important requisite in a dental student. Then thousands of dollars were expended for artificial teeth, while a comparatively small amount was paid in the attempt to save the natural ones. Then the time and attention of the dentist and student was mainly devoted to

this branch; now but few among operators or students can be found to do it homage. At one time it occupied a *prominent* position in this and similar associations; now it is almost ignored.

Gentlemen, if these statements are true, is it difficult to see what the final result *must* be?

The entire separation of this branch from the remaining branches is inevitable, unless something is done to awaken new interest in it.

Judging from the past, I do *not think* this is possible, and, therefore would suggest the propriety of our dental colleges striking it from their curriculums for the degree of D. D. S. I do not wish to be understood as advocating turning it out-of-doors, by any means — but I would not have the degree of D. D. S. dependent in any degree upon a knowledge of what is termed "Mechanical Dentistry;" I would have it taught, and our students should have the same facilities they now have for obtaining a knowledge of it; and, should they prefer to spend their time in this department, after passing a satisfactory examination, they should receive a certificate or diploma granting an appropriate degree — say, Dental Mechanician. The student who preferred to spend the time of his pupilage in other departments, omitting this, should be allowed the privilege.

Those of you who have been engaged in the instruction of dental students the past few years, will recognize the advantage gained by this step.

It is a common thing, at the present day, for dental students to object to spending the necessary time in this department to properly qualify them for graduation, as they do not intend to practice it; and if they fulfill all other requirements and pass a good examination before other chairs, no Faculty could well deny them a degree; and what is the result? The teacher of mechanical dentistry must sign a certificate which he knows to be false.

I am aware that there will be many objectors to this proposition; but, gentlemen, I feel satisfied that this will be the final result; it is only a question of time, and the sooner the change is made, the better.

Mechanical dentistry is fast becoming a highway for all the quacks, charlatans and butchers that desire to enter the profession.

They have but to enter a kindred shop, and be taught the mys-

teries of putting up a rubber plate, and then are privileged to go forth and proclaim themselves "dentists," and having secured a few patrons and friends they are recognized by the profession and community as such, and are dubbed "Dr."

Let the public once understand that we, as a profession, do not recognize the mere mechanic as a dentist, and that they are not entitled to the title of Dr., and we should soon put a stop to many of the evils of which we now complain. Some may think it all-important that a student should understand this branch, if he does *not* intend to practice it. I cannot see the importance.

Can a dentist diagnose a case better for this knowledge? Can he make a better prognosis for knowing how to construct a set of artificial teeth? Can he fill a tooth or perform any surgical operation about the mouth with more skill? If so, the surgeon should be required to become efficient in mechanical dentistry, and the manufacture of artificial limbs, before receiving his degree.

The maker of artificial teeth will one day occupy the same relation to the dentist that the manufacturer of wooden legs now does to the surgeon.

REPORT ON ETIOLOGY.

BY SENECA B. BROWN, OF THE COMMITTEE.

IN presenting this brief report on Etiology, other diseases of the dental organs than decay or caries of the teeth will not be considered. From the earliest investigators to the present time, the theories advanced have been about as numerous as the writers on the subject. Former committees, in making their reports upon this subject, have given the names of writers in their order, with what credit the present light seemed to entitle them to. The theory now generally accepted as the primary cause admits of much further investigation into its precise nature and mode of action. Only by its comprehension can hygienic influences be exerted to a satisfactory extent. That defective organization of the tooth structure affords a more ready lodgment for the destroying agents is without question. That deficient elements can be supplied is a generally-accepted fact, and an achievement upon which the dental practitioner of to-day may well congratulate himself.

However, in the best developed and nourished dental structure, we find an agent to which the tooth must inevitably succumb. This agent is now generally accepted as a chemical one — an acid condition. More than a quarter of a century ago, ideas that an agent of a parasitic nature entered into the destruction of the teeth were promulgated. Until recently, nothing has been presented that commanded, to any extent, the attention of the dental profession. Since the report of last year, a work entitled "Dental Caries and its Causes," the researches of Drs. Leber and Rottenstein, has been translated into our own language by Thomas H. Chandler, D. M. D.,— this being an "investigation into the influence of fungi in the destruction of the teeth;" and the deductions in support of the theory appear in the chapter here quoted:

"We have already several times remarked that the action of

acids alone does not account for all the phenomena which appear in caries of the teeth.

"It is true that acids, even very much diluted, can attack the dental tissues; but we find, in their mode of action, differences which distinguish them from the phenomena and from the progress of dental caries.

"The acids attack first the enamel, and rapidly change it to a chalky mass; later, only, their action is felt in a marked manner upon the dentine, which becomes more transparent, and, in fine, as if cartilaginous, by the very slow, but progressive, loss of its calcareous salts. Caries, on the contrary, proceeds slowly in the enamel; it is much swifter in the dentine, where it proceeds promptly along the canaliculi. This difference of progress must be attributed to the participation of the fungi in the work of the caries. The elements of the fungi glide easily into the interior of the canaliculi, which they dilate, and thus favor the passage of the acids into the deeper parts. These same elements cannot penetrate a compact enamel; or, at least, they enter more slowly, and only when the elements which form it have been greatly changed by the action of acids.

"Leptothrix is found almost constantly in the buccal cavity, if great care is not taken to rinse the mouth frequently. Mr. Bowditch, in examining forty persons of different professions, and living different kinds of lives, found, in almost all, vegetable and animal parasites. Those only were found to be free who cleansed their teeth several times a day, and at least once with soap. The parasites were numerous in proportion to the neglect of cleanliness. The means ordinarily employed to clean the teeth had no effect upon these parasites, whilst soap appeared to destroy them. M. Kölliker, out of twenty or thirty young and well persons, found hardly one the papillæ of whose tongue was free from a grayish and granular coating; he, more rarely, met with filaments of the fungus. It is true that regard must be had to the hour of the day at which the examinations were made. It is natural that all these matters should always be more abundant when the individual is fasting. But while, in ordinary circumstances, the fungi are found only at the surface of the buccal cavity, they are seen to penetrate into the interior of teeth during the progress of caries. For them to be able to penetrate thus, it is necessary that the teeth be in

a suitable condition; the enamel and the dentine must have lost their density by the action of acids. It seems that the fungi are not able to penetrate an enamel of normal consistency. The dentine itself, in its normal condition of density, offers great difficulties to their entrance, and we are not yet sure that the leptothrix could triumph over this resistance. We do not speak here of the greenish deposit found upon teeth, which differs from caries, and upon which we have not yet sufficiently experimented. It may happen that, under favor of this deposit, fungi may penetrate into the superficial layers of the enamel, which does not appear to be the case in ordinary caries. Habitually the teeth expose to the action of injurious agents only their crowns, covered with enamel, and this protects them from the attacks of the fungus. We cannot decide, at present, if the leptothrix is able to penetrate sound dentine when, from any abnormal circumstance, it happens to be denuded. But, if the enamel or the dentine has become less resistant, at any point, through the action of acids, or if, at the surface of the dentine, a loss of substance has occurred, then the elements of the fungus can pass into the interior of the dental tissues, and produce, by their extension, especially in the dentine, effects of softening and destruction much more rapid than the action of acids alone is able to accomplish. The participation of fungus is constant in the progress of caries which has reached this stage. As soon as a loss of substance can be shown, there is found the presence of the fungus, so that the question whether or no the acids alone could produce ravages more considerable is without importance. But, in the early stage, when the surface of the tooth is still polished and intact, we have never been able to prove the presence of the fungus. It appears, therefore, that at this stage of the malady, which constitutes the dry caries, properly so called, all the disorders must be attributed to the sole action of acids. The development of the fungus seems to be favored by a neutral, or slightly acid, medium, whilst it cannot flourish in a strongly alkaline liquid.

"We have already called attention to the observation of Dr. Bowditch, who has seen the parasites disappear upon rinsing the mouth with a solution of soap. M. A. Vogel found that the fungus, *oidium albicans*, continued to develop in pure water, in solutions of salt without alkaline reaction, and especially in solutions of sugar; whilst no proliferations could take place in solutions slightly alka-

line. These observations, to judge of them by analogy, seem likewise to prove that alkaline liquids may exercise a destructive action upon the leptothrix."

Attaching to these investigations the importance which they seem, beyond doubt, to merit, may we not with profit give this theory our thoughtful consideration?

After the reading of the above report—

Dr. JUDD said: Any theory of caries that does not give attention to parasitic growth is worthless. It is an interesting study to find out what is fatal to these growths. There are a good many agents which instantly destroy the common forms, as those of stagnant water. Alkaline solutions destroy them at once. A great deal might be accomplished by a proper investigation on this point. That "green stain" is of parasitic origin, I have no doubt. Carbolic acid seems to exert a very deleterious influence on these growths, and when applied to children's teeth, covered with various kinds of deposits, it restores them to a healthy condition, and, I have no doubt, acts by destroying parasitic growth.

Dr. WM. C. EASTLACK, having been called upon for a statement concerning the practice of dentistry in China, responded as follows: You must not expect me to bring you anything new or fresh in dentistry. I can only bring you my personal experience of the practice in China and Japan. I was in Hong Kong for fifteen years. This is a British colonial dependency. I was confronted by a total want of appreciation of dentistry. My experience has been largely the same as yours. I have had for my patients, princes and slaves, Chinese, Siamese, Mohammedans, Turks, Greeks, Austrians, Tartars, representatives from almost every nation. Apart from this, my practice is identical with your own. I might give a very interesting account of my interview with the prince of the country, but this would take up too much of your time. When I went there to practice I was entirely dependent upon my own resources. I built my own chair. All my instruments were manufactured by myself. My patients came to me with marvelous tales of how the Chinese extract teeth without pain. They said they could take out five or six without giving any pain. I determined to investigate the matter. For this pur-

pose I went to Canton. I found them a set of charlatans, mountebanks, and sorcerers, who worked on the credulity and ignorance of the people, and, I am ashamed to say it, there were Europeans who believed in them and submitted to their operations. I endeavored to discover some of their tricks. I found the dentist under a large umbrella, with teeth strung around his neck. This was called the Temple of Horrors. Figures in life-size were hung around, represented as being torn in pieces, boiled in oil, etc. The dentist received me very kindly. I secured some of the white powder which he said was necessary to put around the tooth, after which the patient coughed, and the tooth came out in his hand. The powder was said to be extracted from the sweat of a horse, but on examination I found it to be arsenic. Their method of curing the tootache is by "extracting the worm," as they say. A gentleman told me he saw the worm in the tooth. They contend that, after penetrating, the worm attacks the blood-vessels. The operation in this case almost defied detection; but I stole the instrument with which he worked, which was a common pair of dissecting forceps, apparently, with which he brought out the black maggot and held it up. One of the arms of these forceps was made of bamboo, painted just like the other arm. On compressing this the worm came out. The instrument was placed in the mouth, the worm forced out, and then the forceps reintroduced and the worm taken away. This is the way they influence the natives, and I am sorry to say Europeans are often duped by them. They also make artificial teeth from the tusk of the hippopotamus, carved to a resemblance of the natural teeth, through which they drill holes, and attach to the teeth with copper wire. In Japan, dentistry is more of a science. Doctors and dentists there are nearly worshiped. In Yeddo, I saw a man carve out of hard wood, like mahogany, a plate to fit the roof of the mouth, and in this he inserted human teeth. The work reflected great credit upon his ingenuity. The teeth of the Chinese are very superior. They are finer and more durable than ours. Their diet is cleansing in itself. The Japanese are a most cleanly people. They use tooth-brushes made of willow, cut like a tooth-pick. They do not fill teeth.

I have two students,— one I took to Berlin and one to Philadelphia. They make fine operators. The artificial teeth made by a goldsmith there you would be surprised to see. Caries is not very prevalent. They use very little confectionery or sugar.

LOCAL SOCIETIES.

The Committee on Local Societies made the following verbal reports:

Dr. JUDD said that he had not, as a member of that committee, visited local societies to any great extent. As far as he was acquainted with the doings of these societies in the West and Northwest, they were progressive, and some of them were fully up to the standard of the present body, as their published transactions would testify. He thought it the duty of the Committee to search out and visit those societies which were the most benighted, and stimulate and assist their efforts to gain a more thorough knowledge of their profession. With this view, he had faithfully attended the meetings of the Illinois State Society ever since its organization, and began to entertain hopes of its enlightenment.

Dr. TAFT said that he had visited some twenty-four societies during the last year. He was glad to see them working so harmoniously, and he reported a great progress in almost every instance. He thought these visits should be kept up — they stimulated the local societies to work. Some of them so appreciated them as to pay Dr. Palmer's expenses to come among them to operate for their instruction. Dr. Atkinson, he said, was doing a great work in this direction. The pleasure that it gave the societies to receive their visiting brethren, fully repaid them for going.

Dr. ATKINSON said: My intercourse among the various societies has been very pleasant, especially in the South. There they fight and quarrel, and say I'm wrong, and all that; but when I convict them they are convicted all over. They are honest, and when they give up it's all over, and they go to work on what they have learned. But these New England fellows are hard to convict. They think they are the "hub," you know, and when you show them the truth they say, "that's so," and all that, but they are only convicted on the surface. If you go back to them after awhile, you'll find them sunk right in the old ruts again. Dentistry is moving on. Men are getting clear, and I hold that we, to-day, are the highest representatives of scientific progress on earth.

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